Published December 5 with Current News

Engineering and Mining Journal

McGraw-Hill Co., Inc.
New York and San Francisco

Price, 20c.

November 1, 1919

DEC 18 1919

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Engineering and Mining Journal

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Volume 108 — New York and San Francisco, November 1, 1919 — Number 18

The Turn of the Tide

OUR editorial of Oct. 18 on "The Steel Strike and Others," which defined strikes establishing economic blockades against the public as conspiracies and acts of civil war which should be promptly punished, anticipated by only a week the proclamation of the President in which he enunciated similar principles and warned the conspirators implicated in the threatened coal strike that any attempt to carry out their attack on the public would be punished by the full exercise of his Executive power. This firm attitude met with a hearty response all over the country. Governors of many states in which coal was mined lost no time in making public announcements that they were prepared to back the President's attitude with the full power of their state authority; and a feeling of relief was felt throughout the nation.

The foreboding induced by the constant aggravation of the industrial situation and the revelation of the nation-wide and world-wide underlying anarchistic plotting, changed to a consciousness of a firm footing discovered in the morass. Such progress as our subterranean conspirators had made had been partly under favor of the usual public sympathy with the cause of the workingman; and to the subsequent gloom that followed the revelation of the ringleaders as "red" revolutionists succeeded the calm of the fighting American spirit.

The President's analysis of the "Labor" conspiracies as directed against the commonwealth was verified by the defiance of the President and the law, which was the answer of the organizers of the coal conspiracy to the President's message, which defiance is in harmony with that of the railroad brotherhoods to Congress and the law, in regard to the intention of Congress to include an anti-strike provision in the Railroad Act. Nevertheless, a weakening all along the line has been pronounced. The latest public sentiment is that if there is to be actual conflict between the traitorous organizations and the forces of Americanism, the sooner it comes the better; and that in any case the ringleaders and as many of their followers as need be should be deported; and this change of feeling was not lost on the secret councils of Bolshevism.

Immediately the labor leaders proceed to give the public the inside facts. It appears that the coal strike was incited at this time by the operators, that they might put the miners in a false position before the country. In regard to the steel strike, Samuel Gompers has revealed the astounding fact that paid agents of the United States Steel Corporation have brought this on; that the Steel Corporation has subsidized Bolshevist periodicals and revolutionary agitators, so that a trial of strength between Capital and Labor might be had, and Labor not only crushed once for all, but stigmatized as anarchistic and disloyal. Simultaneously there is revealed by Mexican authorities the fact that the American Consul who was kidnapped and ransomed at Puebla had arranged to have himself kidnapped by orders from Washington, in order to create a grave international situation. These are the angry recriminations of losing parties, who acknowledge that they have been wrong by accusing the other side. We are sorry for Mr. Gompers, whom we believe to be a lover of mankind, as Secretary Wilson called him. He was put in an awkward position between Scylla and Charybdis, between the devil and the deep sea, between Bolshevism and Capital; and he has chosen the untenable ground of approving the actions of the steel strikers while denouncing the strike as the work of anarchists and the Steel Corporation.

Meanwhile, to carry out the President's intention, the Attorney General has found that the Lever War Food Control Act applies, so that under it the ringleaders of the coal strike can be indicted and imprisoned; and he has announced that he will so proceed. At last we have reached, we trust, the turn of the tide.

Emerging from its former position of helplessness under employers, Labor has gradually grown, through exemption by complaisant Congresses from the anti-trust, or anti-conspiracy laws which were imposed upon Business, till it hit upon the weapon of hostile conspiracies called strikes, by which it now proposes to dominate all other classes and defy the Government of the United States. The Executive, listening to the voice of the majority of the people, has indicated that the patience of the lawful Government with the anti-government or anarchistic elements is necessarily at an end; and Congress, if in any degree awake, can do no less than follow the same course.

Bolshevism at Kyshtim Copper

AT THE meeting of the New York Section of the Mining and Metallurgical Society in New York Oct. 21, Mr. F. J. Jones, manager of the copper works at Kyshtim in the Ural region of Russia, gave a simple and instructive account of the changing conditions there since the fall of the Russian Empire. Under the Kerensky regime, conditions remained

fair; the workmen rejoiced in their newly won liberty, but remained industrious and friendly. They made moderate demands for higher wages, which they obtained. With the progress of Bolshevik (radical) doctrines and control, their attitude passed through independence to insolence; they made repeated demands for shorter hours and higher pay, with no opportunity to the employers for discussion, the alternative being the pulling down of the works.

Under these conditions, production fell off from a thousand tons of copper a month to three hundred; and the stage was soon reached when the expenditures of the plant for labor exceeded the income. The deficit was made up by the Bolshevik "government" at Petrograd, which regularly remitted, in order to maintain the needed production of copper. The management were relegated by the dominant workmen to a state of gentle slavery: they were informed that their business was to direct, and that they would not be allowed to leave their work. The problem finally became how to close down without rioting and destruction, a difficulty which was finally solved by getting word to Petrograd not to send the regular funds, and then obtaining permission from the workers to go to Petrograd to investigate!

That is the end of the tale for the present. Mr. Jones observed that in the incessant radical demand in America for shorter hours and higher pay, regardless of economic laws, he saw little difference from the march of events which he had witnessed in Russia; but he was confident that the intelligence and good sense of the American people would prevent the extremes to which Russia had fallen.

That is the comforting and optimistic reflection with which we all close our investigations into the present alarmingly unsound industrial conditions in America, just as, for example was done in our editorial of Oct. 18. Senator Frelinghuysen, speaking in the Senate the other day, characterized the radical campaign accurately and without mincing; and stated that the only thing that would avert the impending catastrophe was the force of Public Opinion.

Unfortunately for our comfortable optimism over the coffee and cigars, facts do not really warrant this reliance. Mr. Jones stated that only 8 per cent of Russians were radicals, and that the 92 per cent were overcome because they would or did not fight until it was too late; and the Bolsheviks disarmed them, and so it became possible for Russia to exhibit for so long a classic example of the rule of a tyrannical minority.

The proportion of radicals in the United States has not been stated. Labor unions and those controlled thereby have been estimated at 4 per cent of the total population, but, together with the families, must make up around 20 per cent. As is well understood, however, there are two distinct factions in the labor unions, of which the radicals are one; and from the strength they are showing in their effort to overthrow conservative unionism and the American government, their proportion to the whole population would seem not to be far different from that quoted for Russia.

Now, what effect will Public Opinion have on this movement? This is already as decided as it can be; but as such it manifestly does not influence the disturbing element, whose reply "The public be damned!" has been actually voiced in recent strikes both in Chicago and New York, and laid down as a principle in the books of their leaders. A supine and complaining public, a supine and threatening Congress, a supine and admonishing Executive Department, will deter this militant radical element about as much as the Aztecs throngs in Mexico stopped the progress of the little band of Spanish invaders under Cortez; or about as much as was the case in Russia. As has often been pointed out, these radicals are aliens. They do not understand English in many cases; they do not understand Public Opinion; they do not understand nor revere the Constitution, Congress, the Executive, nor the will of the majority. Whatever message the above institutions wish to convey to them must be translated into a language which they do comprehend—Action.

By all means, let us trust implicitly in the American people as a whole; but it is not too soon for the Executive, Congress, and the governing Majority to act decisively.

Indian Mineral Lands And the Apex Law

THE regulations covering the working of mineral lands in Indian reservations, which hitherto had not been available for development, were promulgated by the Indian Bureau of the Interior Department on Oct. 11.

A feature of the regulations, in interpreting the law, is that although mining claims may be located in the usual way and of the usual size, these are leased from the Government by the locator, instead of becoming his property; moreover, the mineral leased is only that within the boundaries of the claim, vertically projected downward.

From the legal point of view we have nothing to contribute to this question. From the viewpoint of the engineer and geologist, however, we would consider it unfortunte if the Apex Law were to obtain for these newly released lands. Our opinion is that the Apex Law is and was from the beginning a monstrosity and a mistake, the results of inexpert legislation. To be sure, not very much was known about mineral veins and ore deposits when this law was proposed and carried through by a Western lawyer in the Senate; but this should have indicated the wisdom of corresponding conservative legislation, which would have meant the vertical boundaries determined upon, earlier and since, in most other countries.

The Apex Law was based upon an ideal conception of the nature, form, and extension of an ore deposit, a conception so simplified and conventionalized as to be hardly recognizable in comparison with the facts, which have been established by the process of observation, by miner and engineer. Were all mineral deposits straight and of tabular form—narrow,

regular zones, like sheets of cardboard—passing through the end lines of claims located to cover them, then the Apex Law would have in it the element of equity to the discoverer of an ore deposit which was contemplated by those who enacted it. With the actual endless diversification of form and extent of orebodies, however, the law has at times become a farce, a source of perplexity and inequity, and occasionally a tool in the hands of those who keep within the law by twisting it so as to cover them.

The lack of correspondence between the ideal application of the law and the local facts has given rise to a vast deal of hard-fought litigation, in which justice is often conspired against with fantastic theories; and lawyers, mining engineers, and geologists alike sometimes find themselves perforce so far removed from the realms of reality that there is little if any strain on their consciences if they seek out and recognize only those geological phenomena which will support the side they are fighting for. The mass of legal opinions and decisions has reached formidable proportions, and the courts have turned out, and are still in desperation emitting, in the case of certain special problems, solutions that from the standpoint of the uninvolved geologist are sometimes grotesque. When we reflect upon Anglo-Saxon racial superiority, let us remember with humility the greater good sense of the mining laws of Mexico, as compared with those of our own country; and among the provedly superior features of the Mexican law is the limitation of mineral rights by vertical boundaries of claims.

The elimination of the right of extralateral mining in those mineral lands of the United States last thrown open is therefore, in our opinion, an enlightened act; and we trust that Secretary Lane is correct in so interpreting the law.

Whether anything can be done to correct the situation in the case of older claims, located under the Mineral Law, has long been a subject of debate, many holding that it would be worse confusion to try to simplify the law at this late date than to let it take its own mad course to the end. Some time ago, the Mining and Metallurgical Society addressed itself to this problem, with the co-operation of other societies interested in the welfare of the mineral industries, and made recommendations to Congress; but our impression is that the seed fell upon a stony ground.

Settlements at Trail

THE prominent place that the Consolidated Mining and Smelting Co. of Canada occupies in the affairs of the independent ore shippers of British Columbia makes its methods of settling for shipments, especially of lead ores, of considerable importance. There was much dissatisfaction on the part of shippers with the lead-pooling scheme and the scale of treatment charges set forth in the so-called Schedule B that was in effect at the Trail smeltery up to July 1 last. So pronounced did this become as to lead to the appointment by the Dominion Government of a special committee to investigate the rates charged.

This committee, consisting of S. S. Fowler, Ivan de Lashmutt and James Anderson, with A. G. Langley representing the British Columbia government, met at Nelson, B. C., on Jan. 21 of this year and, after carrying the investigation to Trail itself, reported that no undue margin from increased treatment rates had been derived by the smeltery and that furnace operation under the schedule had greatly improved. Concessions were obtained for shippers, however, which were embodied in the revised schedule known as Schedule C, which became effective on July 1, 1919. This provided the promised reduction in ore-treatment rates, more especially affecting those ores containing zinc and sulphur.

Many complaints have continued to come in, however, from shippers who desired a more definite method of settlement than that afforded by the lead-pooling scheme outlined in Schedule C. In a circular recently issued, certain clauses of Schedule C have been amended. The Consolidated company now guarantees that it will not settle for lead on a lower price than the American Smelting & Refining Co.'s average New York quotation. Soon after sampling, 90 per cent of the apparent value will be paid the shipper, and soon after the close of the second calendar month after sampling the final value will be computed and adjustments made.

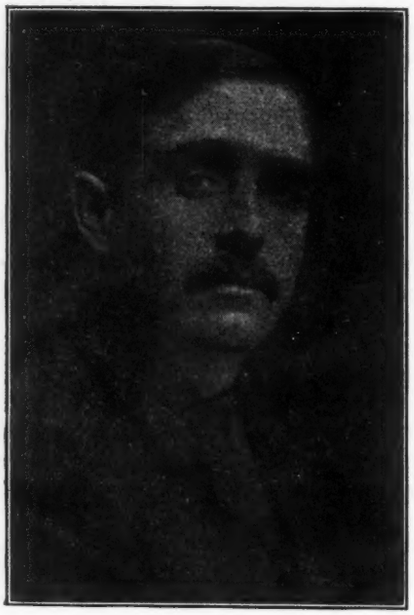
The relations between shipper and smelter are vital, to the former at least. A narrow policy on the part of the smelter can greatly retard the development of mining properties in the district that is tributary to it. The act of the company in question in voluntarily easing the situation for shippers augurs well for the mining industry of British Columbia.

Welding Pipe for Oil and Gas Lines

THE practice of electric or acetylene welding of pipe used in the construction of oil and gas pipe lines is growing. This method will be employed upon a ten-inch gas line soon to be under construction in California. There are other examples of its use. Though it cannot now be considered standard, it is the practice of some of the most advanced engineers to specify the method. The use of a welded joint saves the coupling and the threading of the ends of the pipe. The pipe ends require "scarfing" only, the metal for welding being worked into the V produced by the butting of the pipe ends together.

According to experienced engineers, the joint made by the weld is as strong as the pipe itself. On a pipe line a hundred or more miles in length the saving of weight is an important item. We are of the opinion that welding would be a good thing for compressed-air columns in mine shafts and for air lines of more than nominal size where they have to be placed on the surface and where they are of considerable length. Such a practice would be a saving in first cost, but, more than that, leakage would be reduced to nil by efficient welding.

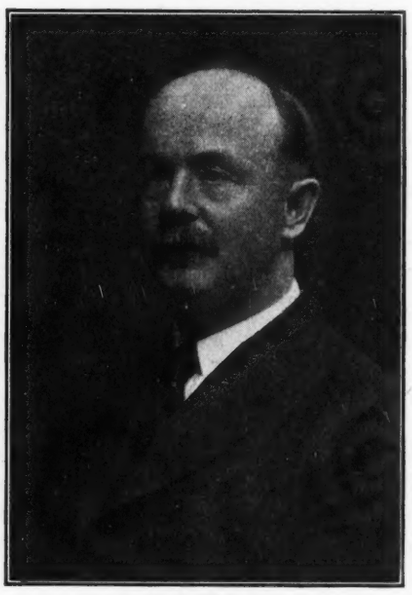
Some Prominent Canadian Engineers



R. B. WATSON
General Manager Nipissing Mining Co.

D. H. McDOUGALL
President, Nova Scotia Steel and Coal Co.; President, Canadian Mining Institute.

S. G. BLAYLOCK
General Manager, Consolidated Mining & Smelting Co. of Canada, Ltd.



C. V. CORLESS
Manager, Mond Nickel Co.

Political and Commercial Geology Series No. 1—The Tungsten Resources of the World*

BY FRANK L. HESS

THE world's known large tungsten fields are grouped along the shores of the Pacific Ocean—not always very close to it, but somewhere in the great mountain masses paralleling its margin, and the western shore is much richer than the eastern shore. In 1918, fully 92 per cent of the world's tungsten came from the Pacific's shores, of which more than 61 per cent was from the west side and more than 56 per cent from the Asiatic border. The east coast produced a little less than 31 per cent, nearly equally divided between the United States and South America. There is only one considerable tungsten-bearing area not situated close to the Pacific, that of the Iberian Peninsula, mostly in Portugal but partly in Spain. Of the less than 8 per cent not produced around the Pacific, it contributed nearly 5 per cent. There are, of course, small deposits in England, Germany, and other places near the Atlantic, but together they produce less than 3 per cent of the world's tungsten ores. The huge continent of Africa has only negligible known deposits; none of consequence are found on the borders of the Arctic, Antarctic, or Indian oceans, except along the narrow Malay Peninsula dividing the Indian and Pacific oceans, and only minor deposits are known in Siberia.

Geographical Distribution

The distribution of tungsten ores is far from being as wide as the distribution of the granitic rocks, and some countries with large areas of granite have almost no tungsten minerals, such as the Scandinavian peninsula, large stretches of Canada, the eastern United States, and Brazil.

Considered as a single metallogenic province, by far the greatest production comes from the region in southeastern Asia which includes the Malay Peninsula, Burma, the Shan States, Siam, Tonkin, and southeastern China. The second largest producing metallogenic province is the Cordilleran, including Bolivia and the adjacent closely related areas of Peru, Argentina, and Chile, to which the United States and Mexico would be a close third. Portugal, Spain, and Italy form the fourth province, to which are closely related the Cornish-French producing areas. Australia, including Tasmania, is next in importance, and is a distinct province, practically all the ores being found in the ranges of the eastern side of the continent. Japan and Korea also form a rather distinct province, which may continue into Manchuria. Mexico, as has been indicated, should be included in the same province as the western United States.

Tungsten, even more than tin, is found almost exclusively with granitic rocks. In a few places tungsten deposits are found in volcanic sedimentary, or metamorphic rocks, but, as is postulated with certain tin deposits, many of these cases may be explained on the supposition that it is not far vertically to underlying granite. There is among the deposits themselves a considerable variety of forms, and they may be classed as segregation deposits, pegmatite dikes, veins, replacement deposits, contact metamorphic deposits, and placers.

Segregation deposits are few and of little importance, and constitute those deposits in which wolframite is segregated in granite like biotite or hornblende. A closely related form is the occurrence of tungsten minerals in aplitic granite, and this grades almost insensibly into the second type, the pegmatites. The pegmatites are also of comparatively small importance, but do yield certain quantities of tungsten minerals. The pegmatites also grade into the next type, the veins, which have heretofore furnished the greater part of the tungsten minerals of the world. Intimately connected with the veins are the fourth type, replacement deposits, in which the country rocks alongside the veins, though the veins may be very small, are replaced by various minerals, including those of tungsten.

Closely related to the replacement deposits are the contact metamorphic deposits, the fifth type. These only recently have begun to be of commercial importance, but promise to be among the greatest, if not the greatest, producers of this country and possibly of other countries. The tungsten mineral in such deposits is invariably scheelite. Placers, the sixth type, are formed from all grades of deposits, but their value depends largely on local conditions. They are both residual and fluviatile deposits, and have been large producers of tungsten minerals, especially of wolframite.

Uses of Tungsten

The essential uses of tungsten are as an alloy in high-speed tool steel, for the making of filaments for incandescent lamps, for targets and cathodes of Roentgen ("X") ray tubes, for electric contacts to be used in explosion engines, and whenever an intermittent electric contact is needed. Other uses are the addition of tungsten to saw and some other steels, as a constituent of stellite, in a tungsten iron alloy for valves in automobile and airplane engines, for kenotrons and similar instruments, in a manganese-chronium-tungsten-iron alloy for wire drawing dies, wire cloth, luminescent screens for Roentgen ("X") rays, mordants, and minor chemicals. The use of tungsten in high-speed steels is as standard as the use of yeast in bread and, though assiduously

*Department of the Interior, Political and Commercial Control Series No. 15, revised by the author and somewhat abridged for publication by the Engineering and Mining Journal.

hunted, no substitute is known which will satisfactorily take its place. The Alloys Steel Co., one of the larger producers, makes a large part of its steel in the electric furnace, and it is understood that the Crucible Steel Co. and some other steel companies also make a part or all of their steels thus. The removal of tin, copper, and other impurities from ferrotungsten by grinding and chemical treatment has made possible the use of impure ores in the production of high-grade ferrotungsten in the electric furnace.

Production

The world's production of tungsten ores by metallogenic provinces and political areas is shown in the following table. Unless otherwise noted, the short ton of 2,000 pounds is used throughout this paper, and the term "tungsten ores" denotes material carrying 60 per cent WO_3.

THE WORLD'S PRODUCTION OF TUNGSTEN ORE, 1913-1918 (INC.) BY METALLOGENIC PROVINCES AND POLITICAL AREAS.

In Short Tons (2,000 Pounds) of Concentrates Containing 60 Per Cent WO_3.

PROVINCE	1913	1914	1915	1916	1917	1918
Asia						
Korean,						
Japan	327	226	478	771	808	650
Korea (Chosen)	—	—	74	612	993	1,000
Chino-Malayan,						
China	—	20	39	120	1,500	10,500
Tonkin	100	119	219	250	422	450
Burma and Shan States	1,733	2,388	2,716	3,818	4,600	4,870
Siam	1	33	475	584	800	800
Federated Malay States	273	317	363	577	853	920
Trengganu	—	173	175	312	350	350
Johore and Kedah	33	—	—	48	200	582
Billiton and Singkep	30	30	60	60	60	60
Indian,						
India (excluding Burma)	—	—	—	51	75	46
	2,497	3,306	4,599	7,203	10,661	20,228
Australia						
Australian,						
Queensland	587	442	708	503	519	393
Northern Territory	42	50	173	257	273	459
New South Wales	220	244	109	345	297	325
Victoria	1	—	—	1	—	—
South Australia	—	—	—	1	—	—
Tasmania	89	61	114	129	315	485
Western Australia	1	1	—	—	—	—
	940	798	1,104	1,236	1,404	1,662
Oceania						
Oceanic,						
New Zealand	297	274	261	346	241	146
South America						
Cordilleran,						
Chile	—	—	—	10	3	—
Argentina	591	482	189	908	1,247	725
Bolivia	328	320	902	3,624	4,645	4,625
Peru	357	234	455	586	470	277
Brazilian,						
Brazil	—	—	—	6	—	—
	1,276	1,036	1,546	5,134	6,365	5,627
North America						
Southwest American,						
Mexico	—	—	155	175	340	326
United States	1,537	990	2,332	5,923	6,112	5,029
Alaskan,						
Alaska	—	—	—	46	32	12
Canadian,						
S. E. Canada	12	—	—	—	—	20
	1,549	990	2,487	6,144	6,484	5,387
Europe						
Scandinavian,						
Norway	11	4	10	10	10	10
Franco-Cornish,						
England	204	230	399	449	265	330
France	200	200	200	182	182	180
Iberian,						
Portugal	900	1,000	1,030	1,563	1,741	1,300
Spain	169	135	211	187	446	425
Italy	—	—	—	6	1	—
Erzgebirgan,						
Germany	150	150	150	350	200	200
Austria	75	75	75	150	150	150
Russian,						
Russia	—	—	—	36	110	150
	1,709	1,794	2,075	2,933	3,105	2,745
Africa						
South African,						
South Africa	—	—	1	3	24	57
World's total production	8,268	8,198	12,073	22,999	28,284	35,832

Developments and Changes in Geographical Distribution in the Near Future

The increase of output from eastern Asia has been marvelous. In 1913 it amounted to 2,497 tons, and in 1918, to 20,228 tons—more than 56 per cent of the world's production. As in other parts of the world, production must decrease until the accumulated stocks in the reducing centers are used; then it will again proceed as it has in the last few years. The alluvial deposits of China are by no means exhausted, the veins are scarcely touched, the tungsten-bearing area is large and only partly prospected, and such prospecting as there has been has been almost wholly for placers. Labor is cheap, and a large future output is sure. Although proceeding slowly, more liberal ideas of trade and government are taking root in China, and educated Chinese or trained foreigners will in time work the deposits, and the output will be large for a long time, though it may never again be as large as it was in 1918.

So far as can be learned, the easily worked placers of Burma and the upper parts of the veins are becoming exhausted rather rapidly,[1] and recourse must therefore be had in the future more and more to the mining of those parts of the veins below water level and in harder rock, and this will probably mean a diminution rather than an increase in output. Siam seems to be a country which should give an increased production, as the mines are comparatively new, and there still should be opportunity for discoveries. The Federated Malay States and the unfederated states—Johore, Kedah, and Trengganu—should produce at least as much in the immediate future as in the past—given demand and an equal price.

Like other British possessions, Australia labored under the handicap of a comparatively low fixed price for tungsten ores during the war. This price, at first 55s. per long ton unit c.i.f. London, was later raised to 60s. The price paid in Australia during the earlier part of the war averaged less than one-half that paid in the United States, and only a little more than half that paid in regions other than the British provinces, with the result that the Australian tungsten production did not increase as it might have done during the war, had prices been higher. The cream of the known deposits is gone, except in Tasmania, where contact metamorphic deposits on King Island have quadrupled the Tasmanian output. The tungsten minerals produced in Australia are largely wolframite, with smaller quantities of huebnerite and scheelite. The huebnerite is apparently rarely recognized as such in the British market, but is all sold as wolframite. Except for the contact metamorphic deposits on King Island, Tasmania, the deposits worked are mostly veins, with some pegmatites.

In New Zealand, the production is wholly scheelite, and increased considerably during the war until its last year—1918—when, apparently owing to a lack of efficient labor, it fell to the lowest point since

[1] Burma Chamber of Commerce and Tavoy Chamber of Mines, Memorial to Sir George Barnes, Mining Journal, London, Vol. 121, May 4, 1918, p. 261.

1909. The probabilities are that there will be a stoppage of output for the present.

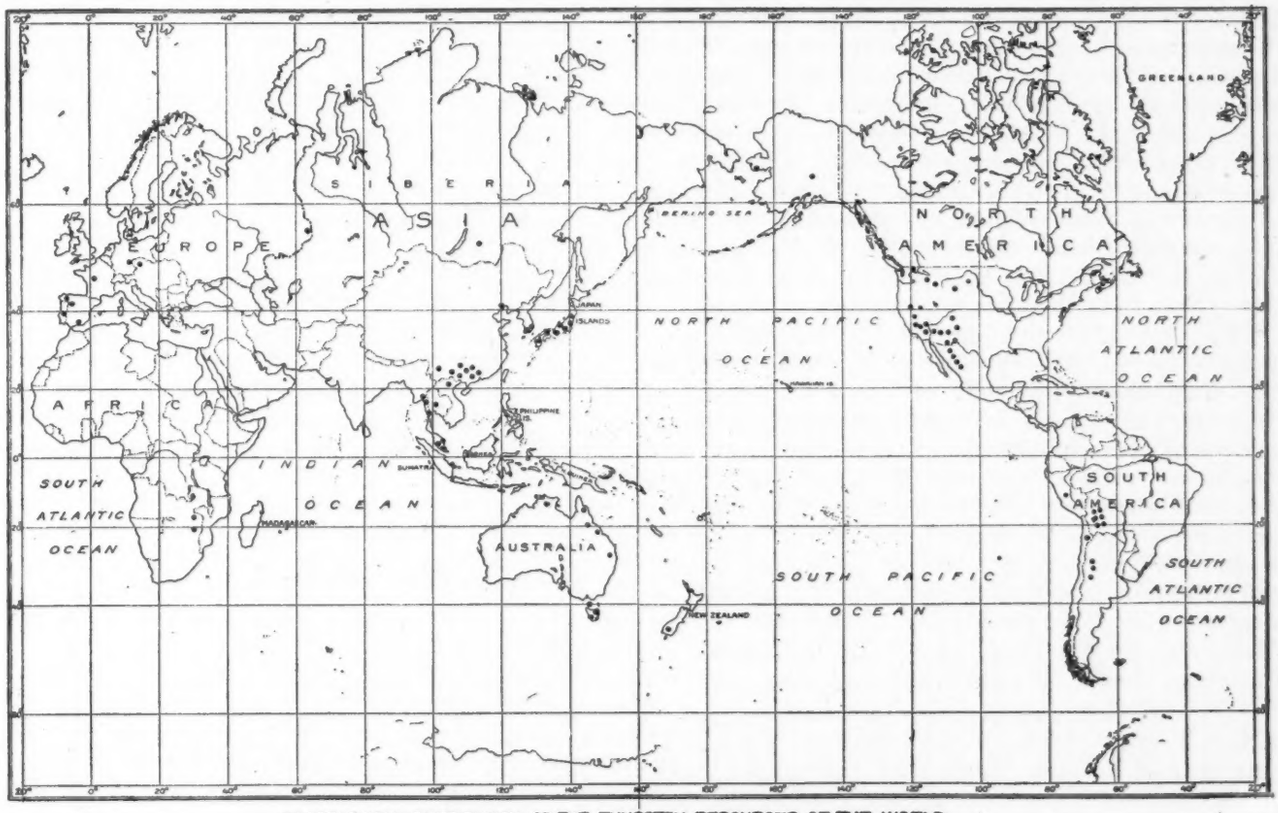
The increase in production of Bolivia has been very great. The deposits seem to be wholly veins and derived placers. The veins are closely connected with the tin deposits, and tin and tungsten are frequently found in the same veins, but many tungsten deposits contain little or no tin. The tungsten minerals mined are ferberite, wolframite, scheelite, and some huebnerite, mixed in some veins and in others wholly separate. The mines occur in and on both sides of the eastern Cordillera of the Andes through a distance of nearly 400 miles from a point near Puerta Acosta on the northwest to Chorolque on the southeast. Prices for mining during the war rose greatly, in sympathy with the rise in other parts of the world. Wages did not rise to great heights, but the cost of materials increased materially. Transportation conditions are always bad in most of Bolivia, and heavily increase expenses. These circumstances cause great sensitiveness to a decrease in demand or prices, and the output from Bolivia fell quickly after the armistice, but should high prices come again, the output will probably again increase quickly. Some modern plants were placed at mines before or just as the armistice was signed, and when world stocks of tungsten are used, and there is again a demand, some ore will be produced at even less than $10 a unit, though the average cost seems to be about $12 a unit, at the mine. [2]

[2] Hazeltine, Ross, United States Consul, La Paz. Report dated May 14, 1919.

The Peruvian output as now produced is apparently dependent upon high prices, and could probably remain at the level of 1916 for several years if prices were sufficient. The Huaura deposits are reported to be large, though of low grade, and may, under proper management, yield largely even at lower prices. They have been under the control of German firms during the war, and probably still are.

Until 1911 the United States was the leading tungsten-producing country, but in that year was passed by Burma, which kept the lead until 1916, when the United States again became the principal miner of tungsten ore, but in 1918 China came into the excessively high-priced market with a production that exceeded by nearly 1,000 tons the world's production of any year before 1915. North America increased its output from 1,549 tons in 1913 to 6,512 tons in 1917, but it dropped back nearly 1,000 tons in 1918 (to 5,567 tons). The decrease of production in the United States was due almost wholly to the fall in price, and only partly to exhaustion of deposits. Although the Boulder tungsten field has seen the exhaustion of some of its best deposits, and the cost of production has become much greater, owing to the impoverishment of others, and though the same thing is true in some other places, it seems possible that in the country as a whole the production can temporarily be made about equal to the highest made before, providing prices are as high as at that period, owing to the discovery of the contact-metamorphic deposits of the Great Basin.

In Mexico the tungsten deposits are apparently a continuation of those of southern Arizona. So far



GEOGRAPHICAL DISTRIBUTION OF THE TUNGSTEN RESOURCES OF THE WORLD
Frank L. Hess

as known, all the Mexican deposits carry scheelite, in places partly replaced by cuprotungstite. The known worked deposits are in the Sahuaripa district of Sonora and are described as veins in which scheelite is found with copper minerals and a pegmatite dike in which large masses of scheelite and molybdenite are found.

European Tungsten Production

European production increased about 50 per cent between 1913 and 1918, mostly in Portugal, and the production of tungsten ores in Portugal apparently did not reach its maximum. The deposits exploited have been both placers and veins, and there still seems to be placer material to be worked, as well as the veins, which are said to be far from exhausted.

For the Spanish output it is difficult to prophesy, because the data concerning the mines are meager. It seems probable that from the English and French deposits, under similar prices, about the same output as in the past may be expected. The English output decreased in 1917 and raised only a little in 1918, despite the British government's interest in a larger quantity of concentrates. No accurate data are available from France. The German and Austrian deposits have probably been worked so hard during the Great War that less is to be expected from them than they have heretofore produced.

The principal changes in the distribution of production during the next few years would seem to be: Further development of veins and contact-metamorphic deposits in Korea; the possible development of veins in Manchuria; development of new placers and veins in southern China and Siam; both veins and placers in Bolivia; a tendency in our own country to largely increased production from the contact-metamorphic deposits of the Great Basin; and both veins and contact-metamorphic deposits in Mexico. There will possibly be a decrease in the Atolia and Boulder fields of the United States; in Australia, Japan, Germany, and Austria.

Political and Commercial Control

Actual control of the world's tungsten deposits is considerably different from that indicated by the production within political areas. That actual control is justly obtained through ordinary competitive purchasing, ownership, by nationals (sometimes by governments) of deposits, and through commercial alliances. Control through ownership of banks and transportation lines may be just, or it may be bulldozing and commercial brigandage, such as that made possible by seized ports used for coaling and repair stations which command the junctions of trade routes—methods that are merely refinements evolved since the days when "They sought their fortunes as they pleased abroad, the crown annoying them with no inquiry to embarrass their search for Spanish treasure ships, or their trade in pirated linens and silks."

Owing to the close relationships between foreign governments and private firms, illustrated by the German government's interest in dye, potash, and shipping firms, and the British government's participation in nickel mining and ferrotungsten-making companies, it is not practicable entirely to separate governmentally and privately controlled deposits. Under the weaker governments, deposits owned by British subjects are to all intents and purposes British, but owing to the difference in national policies, foreign deposits owned by Americans are not necessarily under American control; in fact, instead of helping and encouraging our pioneers in foreign trade, we are likely to harass them and destroy their business with drastic tariff laws.

THE ACTUAL CONTROL OF THE WORLD'S TUNGSTEN OUTPUT IN 1917 AND 1918
In Short Tons of 2,000 Pounds

	1917		1918	
British Possessions	Quantity	Per cent of World's Output	Quantity	Per Cent of World's Output
Burma and Shan States	4,600		4,870	
Federated Malay States	853		920	
Trengganu	350		350	
Johore and Kedah	200		582	
India	75		46	
Australia	1,404		1,662	
New Zealand	241		146	
England	265		330	
South Africa	24		37	
	8,012	28.4	8,943	24.9
Obtained through trade and political pressure:				
Japan and Korea (including ores for France)	790		None	
China and Hongkong (including ores for France)	1,105		900	
Siam	600		600	
Billiton and Singkep	60		60	
Argentina, Bolivia, Peru (including ores for France)	2,035		950	
Portugal	960		800	
Spain (including ores for France)	446		425	
	5,996	21.3	3,735	10.4
Total ores under British control	14,008	49.7	12,678	35.3
French				
France	182		180	
Tonkin	422		450	
Siam	170		190	
Portugal	650		440	
Bolivia (see Great Britain)	?		?	
Argentina (see Great Britain)	?		?	
	1,424	5.3	1,260	3.5
German				
Germany	200		200	
Austria	150		150	
Norway	?		.....	
Portugal	?		?	
Spain	?		?	
	350	1.2	350	1
American				
Canada	.....		20	
Mexico	340		326	
Peru, Bolivia, Argentina	4,330		4,677	
Japan and Korea (includes some Chinese ore)	1,010		1,650	
China and Hongkong	395		9,300	
Portugal	130		60	
Siam	30		12	
Domestic production	6,144		5,041	
Totals	12,379	43.9	21,150	59
Japanese (Quantity smelted only)				
China	?		300	
Norwegian				
Norway	10		10	
Russian				
Russia	110		150	1.3
Totals	28,188		35,832	

The above table practically shows only where the ores of various countries go for treatment, and is, of course, only a generalization, and is obsolete before it is made, for trade conditions change constantly. For instance, Japanese electric furnaces are beginning to smelt tungsten ores, though at present to the extent of only 10 or 15 tons of contained tungsten per month, but it is conceivable that the output may be greatly increased. Although

[3] Wilson, Woodrow. "A History of the American People," Vol. 1, p. 25.

Japan could control the disposition of its ore, it is given credit for control only of its smelted ore. It is impossible properly to divide the ores from Argentina, Bolivia, Peru, Portugal, and Spain among their customers; and other weaknesses, those inherent to most statistical studies, are also present. The table is approximate only, but is thought to furnish instructive data.

British Control

The British government during the war demanded and obtained all of the tungsten ores produced in its colonies and possessions. This restriction was later lifted as applied to Canada, and the new rule allowed Canada to ship tungsten ores to other Entente nations, but as Canada was not a producer the license granted amounted to nothing except as it eased the feelings of the Canadians. Scheelite deposits have been discovered in Manitoba, however, that for a time seemed to be potential producers. Nominally, Siam has remained free from British control, because more or less under the zone of influence of the French, but diplomatic pressure seems to have been exercised at Bangkok. Most Siamese tungsten-bearing ores contain some tin, and have gone to Singapore for separation, and when once within the British possessions, of course, the ores could not be shipped out of them. British control of Siamese shipments is thus apparently as complete as if the shipments were made from a British province.

In southern China, Hongkong being the port of Kwangtung and Kwangsi, and parts of southern Kiangsi and Hunan, the British exercised control over the export of ores produced in those districts, for a while[4] refusing to allow the re-shipment of ores unless they were sent to England. Foreigners, including Americans of course, are not allowed to own mining property in Burma, the Federated and unfederated Malay States, or Australia, territory producing nearly all the tungsten ores of the British Empire. In Argentina small tungsten mines are owned by English companies.[5] In Bolivia the English and French governments during the war leased mines directly, and came into direct competition with American business men engaged in the buying or production of tungsten ores.

British Efforts to Extend Control

British traders are constantly striving to increase their control of Bolivian tungsten ores, and the efforts are not confined to the control of properties through buying. The English apparently have complete control of the financial system of Bolivia so far as foreign exchange is concerned. An American interested in a tungsten mine in Bolivia has stated to the writer that it is almost impossible to do business with English banks, because they insist that if they extend commercial courtesies, even for pay, the recipient must buy only English mining machinery. If miners do not wish to deal through English banks, they are compelled to cable money to and from New York at a considerable expense. The American banking interests represented in Bolivia are apparently too conservative to advance money on ore shipments, as have German and English representatives, who, I am told, advance up to 80 per cent of the market value of ores shipped. This is good business. Mining corporations are also controlled by English firms, and, of course, the material is then shipped to England, and it is impossible for Americans to compete for the production. The control of the Bolivian mines by the English is not yet dangerous to American interests, except through the banking system, but entire control may be passed to them, to the Germans, or the French through American tariff legislation.

In Portugal, English companies control a number of the mines, and it has been alleged by at least two Americans[6] that the British government, through its representatives at Lisbon, for a period of more than two years, prevented title passing to American companies. The Thermo Electric Ore Reduction Corporation, Ltd., seems to be the principal English owner of Portuguese tungsten mines. In the Dutch Indies, the British are understood to have control at present of the wolframite production, which, however, is comparatively small, about five tons a month.

French Control

French control of tungsten deposits is not large. It includes the production of France and that of Tonkin, a part of that from Portugal, and a comparatively small interest in Bolivia. During the war, control in Portugal was attempted by England and France. The prices offered by the English and French were much below the market prices of New York, and the Portuguese government stepped in and raised prices to a point somewhat lower than those of the United States, but 20 per cent higher than the prices offered by England and France.

Japanese Control

Japan has within her own borders a considerable number of tungsten deposits situated in the southern part of the islands, but all are small. In Korea important deposits have been discovered and actively worked, especially within the last two years. Deposits in Manchuria are also said to be controlled by the Japanese, but little is known of them, and if they exist they are probably small. Japanese ores have come largely to the United States for several years. As has been said, Japanese firms have erected electric furnaces in which a part of the tungsten ores are reduced, probably the equivalent of 25 to 35 tons per month of concentrates carrying 60 per cent WO_3.

American Control

The United States controls entirely the tungsten deposits within its own borders and Alaska. Americans operating in Mexico have produced 200 to 300 short tons of scheelite concentrates per year from deposits in the Sahuaripa district, Sonora. Wolframite is said to have been shipped from Sinaloa to the United States, but its real origin is unknown. Contact metamorphic deposits carrying 0.7 per cent

[4] Anderson, George E., American Consul General, Hongkong, China. "Tungsten From South China." Commerce Reports, Nov. 9, 1917, p. 546.

[5] Sharp, Ralston C., "Wolfram Deposits in the Argentine." Mining Magazine, London, Vol. 18, May, 1918, pp. 230-233.

[6] Personal communications.

WO_3 and 1 to 2 per cent copper have been found about sixty miles southwest of Nacozari and are owned by Americans, but are not now productive.

In Bolivia, Americans own some of the more important tungsten mines. The American firms known to own tungsten properties in Bolivia are W. R. Grace & Co., local address, La Paz; Stewart, Wilson & Hepburn, Oruro; Easley & Inslee, La Paz; and C. Dillon, Oruro. Their total output is estimated to amount to about 1,600 tons, out of a total output of more than 4,000 tons for the country.

In southern China, as already noted, American firms have worked up the tungsten trade extensively, so that, through this source, the United States controls (or, more properly speaking, Americans control), unless interfered with, a trade of possibly 9,000 short tons of tungsten concentrates per year. In Siam one or two United States companies have attempted to produce tungsten, but British influence during the war made it difficult to ship even small lots of ores to this country.

Because it offered higher prices than other countries, and because the trade route was more direct and shorter, so that it was to the advantage of the Japanese to trade with this country, the United States largely controlled the Japanese output of tungsten ore in 1918. This trade probably has been somewhat and will be further curtailed through the erection of electric furnaces in Japan.

United States Imports in 1918

The United States imported in 1918 36 per cent of the tungsten output of the world, and adding this to the domestic output makes a total of 17,921 tons, or 50 per cent of the world's production. There is a lag in the shipments from South America of about two months and from China of about three months, so that the South American ores received in January and February were from the output of 1917, as were the Chinese ores arriving up to the end of March. Subtracting the ores from the two regions arriving during the first two and three months respectively of 1918, and adding the ores arriving during a like period in 1919, the quantity of ore controlled by the United States in 1918 was equivalent to 21,131 tons of concentrates carrying 60 per cent WO_3, amounting to 59 per cent of the world's production. These ores were all controlled through the private initiative of American firms, which offered better prices and better terms than could be obtained abroad. Probably a larger proportion could be handled in the future should interference not come from within our own borders. It is now proposed to put a tariff of $10 a unit on tungsten ores, without regard to purity or quality, and a bill providing such an impost has passed the House of Representatives, with a correspondingly high tariff of $1 a pound, plus the 15 per cent ad valorem duties now in force, on metal in any form—element, alloy, or salt. It is believed by its advocates that the price, now about $7 a unit in New York, will be raised to $17 a unit.

Hereafter the quantities of tungsten ore handled will be much smaller than during 1916, 1917, and 1918, and will be confined to peace-time needs, unless an unforeseen war should occur. England has at present two years' supply on hand, according to government estimates. France is probably equally well supplied. The United States presumably has on hand an equivalent of 8,000 tons of ore carrying 60 per cent WO_3. Tool-steel makers have figured on a consumption of 7,500 tons during the current year, but, as shown by the lack of market for ore, this is undoubtedly much too high, and probably 4,000 tons is amply large, so that there will likely be little if any market for new supplies for nearly two years, except as ore may be bought speculatively. During this time, mines everywhere must close and remain so until a demand again arises, except for the number required to furnish the tungsten to be taken by Germany, Austria, and Russia, and the small quantity required by Sweden, Norway, and Italy.

If Germany, Austria, and Russia recover economically, so that they can buy and use tungsten, Germany will have regained, in the ores that will be eagerly offered by producing nations needing a market, a part of the trade she has lost. Traders of England, France, and the United States will be glad to sell tungsten and ferrotungsten, but Germany will undoubtedly reach out for raw material in order that she may make as much use as possible of her abundant unemployed labor. Should a tariff law like that now proposed be passed, the United States will have cut off its foreign supplies and will have ended its control of any considerable part of them. However, should a high price be maintained, artificially or otherwise, the development of other alloy steels for use in multiple-edged tools may have reached a point where not so much tungsten will be needed.

German Control

Germany has had no considerable tungsten deposits at home and none in the foreign territory which she held, but her control of the tungsten trade through business alliances covered in 1913 about two-thirds of the entire tungsten-ore output. In that year, according to the German official figures, 5,295 short tons of tungsten ores were imported. Most of this probably carried 65 per cent or more WO_3, equivalent to, say, 5,736 tons of concentrates carrying 60 per cent WO_3. Adding the 106 tons of Saxon concentrates produced in that year, it is apparent that Germany treated a total of approximately 5,840 tons out of a world's output of 8,864 tons, or about 66 per cent of the total. The United States in the same year produced 1,537 tons and imported 449 tons of unknown content, but the whole was probably equivalent to more than 2,000 tons of ore carrying 60 per cent WO_3, leaving only about 1,000 tons for other countries, most of which seems to have been treated in France. This trade Germany lost when, with Austria, she started the Great War, and control shifted to England and the United States. With the cutting off of all shipments by ocean to Germany, most of the foreign ores were denied to her, but undoubtedly small quantities leaked in through Sweden and Norway for a considerable time after the beginning of the war. The small output of Austria was always available, but it is said that a

considerable amount of ore was smuggled over the border of Portugal into Spain, thence by water to the western frontier of Italy, into Switzerland, and from there shipped direct to Germany. A large part of the Spanish production is said to have reached Germany in this way also, and the "crippled" submarines which landed at Spanish ports are reported to have carried out cargoes of tungsten for Germany.

In the Allied countries and the United States, the German interests were taken over by the respective governments, but in South America, German firms still hold some control of tungsten-bearing properties. In Bolivia four German firms are said to have an output of about 600 metric tons of ore per year. In Peru what is said to be the larger part of the tungsten deposits have been controlled by firms thought to be German, E. y W. Hardt and Carlos W. Weiss y Cia. In Argentina the Hansa Mining Co., a German company, is the principal producer, and is said to have an output of about 500 tons of concentrates a year. Even this firm's output is said to have come to the United States during the war. If the United States is placed under the prohibitive tariff passed by the House of Representatives, German control of the world's tungsten trade may be in large part easily recovered.

What Control Means in the United States

In good business years before the Great War, the United States used an equivalent of 3,000 to 4,000 short tons of concentrates carrying 60 per cent WO_3 per annum. When the war began, there was a lull while the attacked countries caught their breath and prepared for a long struggle. After plans had been made, and the manufacture of munitions began on a great scale, the demand for tungsten ores rose enormously. All kinds of ores were taken at fabulous prices. Ores carrying tin, phosphorus, sulphur and bismuth, that before would not have been considered by steel makers, were bought with avidity, and there was a great scramble for deposits. In October, 1918, the United States was using tungsten ores at the rate of 20,000 tons per annum. Meanwhile, prospecting had uncovered so many new deposits, and they were so actively exploited, that great stocks of ore were accumulated in the Entente countries. On the other hand, in this country many of the known deposits showed signs of impoverishment, a number which gave a profitable production for a short time became wholly imperative, and it is likely that some of the deposits that have seemed to be the richest will never again produce largely. Among the new discoveries were the contact metamorphic deposits of the Great Basin—California, Nevada, and northeastern Utah. They were partly developed, and several promise well, but the irregularity of contact metamorphic ore deposits is notorious.

In 1916, under prices ranging from $15 to $93.50 per unit, the United States produced 5,969 tons of concentrates; in 1917, while still under the impetus of the 1916 boom and prices ranging about $25 per unit, 6,144 tons; and in 1918, still under a price averaging about $25 per unit, 5,041 tons, though little was produced in December. Under a price of $17 per unit, which tariff advocates think can be reached by means of a tariff of $10 per unit, it seems improbable that the United States can depend on a production of more than 3,000 tons a year for the next three years. There are, of course, possibilities of larger production, and there are equal possibilities that it would not be so large. Should another great war takes place and, in the belief of many, this does not seem beyond the range of imagination, instead of gradually working up to such a consumption, the United States would probably begin by using tungsten at the rate of 20,000 tons of concentrates per annum. Unless the price were even more extravagant than the highest price in 1916, $93.50 per unit, the United States would not produce half of its needed concentrates, and the time required to reach that output would be far too long for safety. Of course, such a production would be much better than none, but the United States should, for safety, have within reach at least a year's supply.

The Pacific, around the borders of which are the largest tungsten deposits, is by many looked upon as the next theatre of war, and, however vitally needed, it might not be possible to get supplies of tungsten ores, owing to the blocking of trade routes. It would, therefore, seem vastly better that, instead of putting a premium on the quick depletion of our own already too meager supplies, we should use the rich low-priced ores now being produced in the Orient. These cheap ores we may have in trade for the asking, and it would be one of the best forms of national life insurance were the government to store 10,000 tons of these ores while they may be had.

The argument is often made that by putting a high tariff on tungsten ores we would have our own deposits developed so that quick production could be made when needed; also that with the need we would find more ores. Both arguments are specious. What is meant is not development but removal. No one will open up a tungsten mine to let the ores stand against the country's day of need. The finding of new ores is a probability, but the quantity is wholly a question. Few tungsten mines of the United States can be profitably operated at the present price of less than $7 per unit, and the mines are now closed. The number of persons dependent on the mining of American tungsten ores is small, probably less than 900 in peace times. At present most tungsten miners have already obtained other employment, and practically all could obtain employment fully as profitably in other mines, many of which are short handed, so that no great hardship would be worked, though the inconvenience of moving a family must be recognized. As a matter of national economy, the United States cannot afford to throw away its chance to buy cheap tungsten ores while they are available. Aside from the question of national life insurance as meaning a guarantee of mere existence, not to buy South American ores is to throw away South American trade. In a degree this is also true of Chinese and Japanese ores.

Metallurgy of Tungsten

The metallurgy of tungsten, like that of other metals, is being improved constantly, and should our ores remain in the ground for a time they will be of greater absolute value when mined, because they can be utilized to better advantage, for there will be less waste in conversion. If our ores are mined now under an artificially high price, we will always pay a high price for tungsten ores, for when ours are used the ores in other countries will have diminished in quantity and increased in cost, and therefore become higher in price, and we must buy at the advanced rate. On the other hand, by holding our markets open to cheap ores from any quarter, we will stand on an equal footing with other countries and will always have a reserve of high-priced ores to fall back on when necessary.

There is but one crop of ore. To turn over deliberately all the cheap tungsten ores of the world to our competitors, allowing them this advantage in making high-speed steels with which to compete in foreign trade with our steels and with all products on and in which they are used; to put a premium on the early depletion of our own deposits, leaving us without resources of this indispensable material for peace and war; and to compel our use always of high-priced ores would be economic crimes.

Copper Producers Hope for an Early Improvement in Market Conditions

There are many influences at work at the present that are affecting the copper producers in the United States, both directly and indirectly, and which they are endeavoring to surmount, according to an October report on copper by Eddingfield and Wormser, issued by the Bureau of Mines. The industry's own labor troubles, the effect of the steel and coal strikes, the vicissitudes of other metal markets, and the outlook for copper itself all bear upon the situation. The large unsold stock of copper in the United States, estimated in some quarters at half a million tons, represents a reserve accumulation that can be marketed if necessary. During a session held a few weeks ago, the International Trade Conference echoed the impression felt in this country that the European nations are in need of large quantities of copper.

It is reasonable to suppose that producers prefer to continue at their present output rather than increase the cost of their copper by turning out a smaller amount of metal each month. Until the market improves, little increase in production is to be looked for.

The Utah Copper Company is milling 17,000 tons per day, about half its normal output. In Michigan, where the output is about 75 per cent of normal, it is not expected that production will return to normal until the Central Powers become a factor in the market. The Michigan copper country fortunately lays in a store of coal in the summer sufficient to carry operations through the winter, and hence will not be affected by the coal strike as seriously as some other districts. Michigan formerly sent most of its copper to Germany.

The order of the Railroad Administration requiring the metal mines to use closed cars, to leave the open cars available for coal and sugar-beets, if carried out, will not tend to help production, for a number of the metal mines are not equipped to load into closed cars, and it would be difficult for the smelters to unload sufficient ore to run at normal capacity.

World-Wide Demand for Iron and Steel Expected to Continue for Some Time

The demand for iron and steel products in this country and abroad should tax the capacity of all the steel plants for an extended period of time, according to the October report of Investigation issued by the Bureau of Mines. The greatest domestic demand for steel comes from the railroads, the oil industry, the manufacturers of automobiles and agricultural implements, and for use in construction work. Foreign business, as a consequence, will be subject to rather indefinite future delivery, and thus the rehabilitation of foreign countries affected by the war will in a great measure be dependent on the resources of Continental mills.

Germany, being stripped of her largest iron-ore reserves, is prospecting for new iron deposits within her own borders. The Idarwald, near Coblenz, is a field in which exploration has recently been taking place. Although the deposits have long been known, it was not considered feasible to exploit them while the more profitable Lorraine fields were available.

The Swedish iron industry, according to "Commerce Reports," during the first half of 1919, has been operating under adverse circumstances. This is due mainly to industrial difficulties and sales in the British market of government stocks which accumulated during the war. The exports of pig iron during the second quarter of 1919 were only 23,100 tons, against 54,900 during the same period in 1918.

Tungsten Imports

The following table gives the imports of tungsten-bearing ore into the United States in 1917, 1918, and the first seven months of 1919, as reported by the U. S. Department of Commerce:

Country or Origin	Long tons 1917	Long tons 1918	Long tons Jan.-July 1919
Portugal	107	24	.....
Argentina	192	479	65
Chile	1,723	1,116	387
Peru	1,071	1,631	299
Japan	538	1,215	515
Other Countries	726	5,897	3,206
Total	4,357	10,362	4,472

Coarse Ore Weighs More Than Fine Ore of the same composition. Sometimes it is thought that the opposite is true, on account of the comparatively large size of the voids which occur in a pile of coarse ore, but the larger number of voids in a mass of fine particles more than compensates for their small individual volume. Often, however, the fine ore contains more mineral, and is heavier on that account.

Rand Ore Reserves

A Complete Analysis, Made Upon the Basis of Present Economic Conditions, Showing the Decrease in Tonnage on Account of Higher Working Costs Eliminating the Low-Grade Ore.

BY A. COOPER KEY
Johannesburg, South Africa

THE gradual though insistent advance in the rate of working costs of the Rand gold mines has led to the elimination from ore reserve estimates of considerable tonnages of rock which under earlier normal conditions were considered to be commercial. From the pre-war figure of 17s. per ton, the rate advanced last year to 21s. 7d., and in March, 1919, the average was 22s. 6d. To put it another way, the rise is equivalent to 1¼ dwt. When it is stated that 40 per cent of the aggregate ore reserve has a value of 6½ dwt. or under, the incidence of such a rise, equivalent to a fifth of the value stated, will be apparent. Besides this economic elimination of tonnage, some of the older mines are completely opened up, and, little ground remaining to be explored, there has been considerable encroachment into the reserves previously accumulated. Some of the tonnage now excluded will automatically re-enter as costs recede. Whether they will ever come back to the 1913-14 level is extremely doubtful, in view of the increased rate of wage of the white workers (there has so far been no advance in wages paid to the unskilled native workers) and, what is a far more serious item, the enhanced prices of all necessary stores.

A Classification of 89,250,000 Tons

Analysis of the figures for about fifty mines shows an aggregate of 89,300,000 tons as at December, 1918, which compares with 95,700,000 tons for the same companies the previous year, and 102,000,000 tons at the end of 1916. Values are assigned to the whole of this tonnage, except in respect of 322,000 tons at Robinson, the historic mine of the Rand, now fast approaching exhaustion. With the exception of rather less than 1,500,000 tons at the Cinderella Deep, which has been closed down for some years, and the Modder East, the figures apply to producing mines.

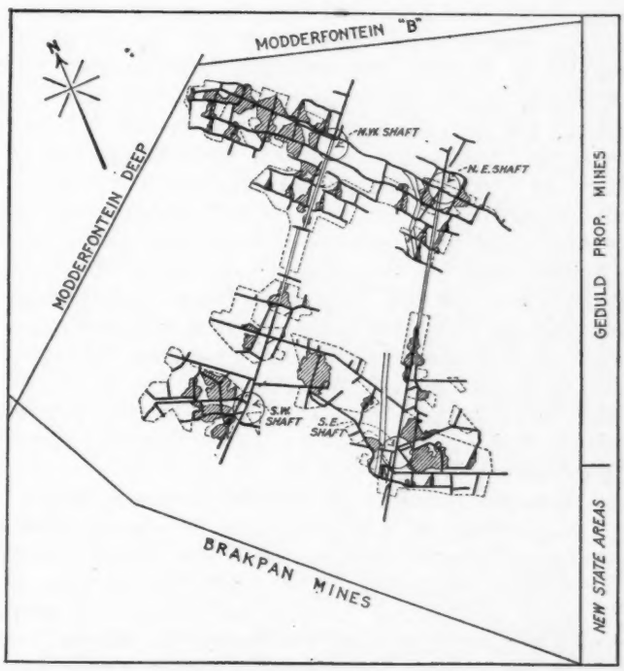
The ore reserves may be classified thus:

Companies	Tons	Value, Dwt.
1	1,882,000	Below 5
15	15,780,600	Between 5 and 6
10	17,932,500	Between 6 and 6½
6	10,171,800	Between 6½ and 7
5	5,167,400	Between 7 and 7½
3	10,725,600	Between 7½ and 8
1	605,000	Between 8 and 8½
4	17,613,000	Between 8½ and 9
2	5,746,000	Between 9 and 9½
1	3,378,700	Between 9½ and 10
2	891,500	Over 10

It will be seen from the table that about 35,500,000 tons (representing about 40 per cent of the whole) has a value of less than 6½ dwt. per ton, or an actual value of 27s. 6d. per ton, without allowing for mining and metallurgical losses. Putting these at 10 per cent as a rough average, it is evident that there is a small margin with costs in the neighborhood of 22s. 6d. Going up 1 dwt. in the classification, there are 39,000,000 tons valued at over 7½ dwt. Of this, 27,500,000 (as valued at over 8½ dwt.) can rightly be considered as high grade.

Higher Values Caused by Eliminating Low-Grade Ore

The shutting out of low-grade tonnage has, automatically and mathematically, had the general effect of increasing the value assigned to ore of commercial grade. But there are exceptions to this, as the values at Brakpan and Springs have each dropped by ½ dwt. and at the Van Ryn (where, in addition, a more stringent safety factor has been employed) by practically a pennyweight.



THE GOVERNMENT GOLD MINING AREAS (MODDERFONTEIN) CONSOLIDATED LTD.

Areas stoped out are shaded. The ore reserves are indicated within the dotted lines.

In one or two instances improved values are in evidence, and, as this applies to the whole tonnage developed, both in the past and currently, it means that the latter has been exceptionally favorable. A case in point is that of the City Deep, the most important mine in the vicinity of Johannesburg, where the value of the whole reserve has increased from 9 to 9.6 dwt. That improvement is in respect of no less than 3,350,000 tons. The advance is owing to the fact that the previous estimate, including ore conservatively valued pending further work, and now

found to be higher in value than anticipated, and the year's development (8,500 ft.) has exposed satisfactory values, namely 19 dwt., over 28 in. Even more striking is the rise of ½ dwt. in the assessed value of the 9,500,000 tons at the Government Gold Mining Areas. Here 23,600 ft. of development was accomplished, of which 17,250 was commercial grade, showing 16 dwt. over 43 in.

One Mine Showed Over 15 Dwt.

The Meyer & Charlton stands in a category of its own, the single representative on the Rand proper of a mine showing more than 10 dwt. (though there is also the Sub-Nigel, at Heidelberg, giving just over that value). The ore reserve value is now slightly under 16 dwt., instead of just over 17½ a year previous, but this is mainly owing to an increase of 4½ in. in the stoping width assumed.

Government Areas' Huge Increase

The outstanding feature of the whole ore reserve position is the remarkable advance of nearly 2,500,000 tons shown by the Government Gold Mining Areas, besides the improvement of ½ dwt. At the year end it had 9,500,000 tons "in sight," valued at 8 dwt., over a stope width of 78 in. In the March quarter a further 230,000 tons was added. The aggregate is now the largest on the Rand, exceeding that of the New Modderfontein, which had for some years held the premier position, with a huge ore reserve, by 445,000 tons. The increase achieved in the year would constitute in itself a handsome reserve. To particularize in respect of far-Eastern concerns, it approximates to the total of such important mines as Brakpan, Geduld, Van Ryn Deep, and Springs. Leaving out the New Modderfontein, whose reserve position, as stated, is practically as sound, the aggregate at Government Areas is as great as that of the next three largest mines of the Benoni district. namely Modder Deep, Modder B., and Brakpan Mines, combined.

A General Decrease at Central Western Mines

The decrease of 6,400,000 tons in respect of the same companies in each period is spread over about thirty-three companies. The drop has been general, inasmuch as the rise in costs has affected all companies without exception. The largest individual drop is in the case of the Randfontein Central, whose total is 4,254,000 tons, as against 5,185,000. Besides economic elimination, recurring strikes have prevented development being upon such a scale as might have been wished. Before the war the former control (the J. B. Robinson group) claimed a reserve of 8,665,000 tons. Fortunately, driving exposed a reef of consistent va'ıe, of good commercial grade even upon a cost figure which is 3s. 4d. per ton higher than that of four years ago.

The Crown Mines has decreased 700,000 tons. owing to shortage of development. The South reef, which was such a fine gold carrier in the Crown reef, is becoming patchy and losing its value at depth. Included in the 8,300,000 tons reserve are 3,275,000 tons on this reef, valued at only 5.6 dwt. over 64 in. With costs at the present level, the profit obtainable from ore of this value is either negligible or entirely absent. Almost as great a decrease in tonnage is shown by the Nourse Mines; though expressed proportionately it is far greater, inasmuch as the reserve at the Crown Mines is four times as large. At the Robinson there is an apparent drop of 620,000 tons, of which, however, only 121,000 is in respect of the Main reef leader and South reef. A year ago a tentative figure of 500,000 tons main reef was included, but it is highly problematical if in these times and under existing conditions any considerable portion of this could be worked with profit.

Low-Grade Mines in Difficulty

As might have been expected, the low-grade mines of the Germiston district have had to reduce their ore reserve estimates, owing to economic elimination of tonnage. In the case of the Simmer & Jack—the first exponent on the Rand of the big-battery policy—the largest decrease was shown, namely 514,000 tons. In that of the Simmer Deep it was 418,000; in the Jupiter, 230,000. The former has been doing so badly of late that there is a probability of its having to close down. In this district, the Glencairn and Ginsberg have stopped milling, owing to the exhaustion of their mines, and the New Primrose's ore reserve has dwindled to 65,700 tons. Wit Deep's ore reserve has dropped from 1,383,000 to 953,500 tons. Only 111,000 tons was developed during the year, in contrast with 377,000 tons milled. Several blocks of ore have been excluded, owing to high working costs and to unsatisfactory disclosures made in them during the year.

Ore reserves at the East Rand Proprietary Mines, one of the great consolidations, have fallen by 465,000 tons, the total now being 2,250,000 tons "scattered over an enormous area; indeed, the whole of the mine workings," three and a half miles along the strike of the reef. It has been found impossible to proceed with the southern development scheme, and the policy of the company is to work out the existing reserves, which will enable milling to be continued during the greater part of next year. At Knights Deep, the decrease has been even greater, 574,000 tons.

Some Western Companies

In the West Rand, in addition to the Randfontein Central, already referred to, there are recorded decreases of over 300,000 tons in the fully developed ore reserve of that low-grade mine, the Roodepoort United. The Bantjes Consolidated has suspended crushing, and its reserves have been reduced to 95,000 tons, a drop of 375,000 tons. Adjacent, the Aurora West comes down from 400,000 to less than 250,000, in this case owing to the exclusion of several blocks of South reef ore. Another West Rand concern, the Luipaardsvlei Estate, decreased 150,000 In all these instances the declines are serious, as the companies, unlike those of the far East Rand, never possessed large ore reserves in the best of times.

Mines Nearing Exhaustion

A considerable number of mines opened in 1887 or thereabouts, at the time of the discovery of the Rand blanket deposits, are fast approaching exhaustion, and rapidly dwindling ore reserves are naturally to be expected. In this category we have the City &

Suburban and New Heriot. But for amalgamation, several of the earlier deep levels would be nearing the end. This represents the case of the Ferreira Deep, whose reserves dropped 375,000 tons last year. The company was formed in 1898, and will rather bear out the original idea of putting down plants with a twenty-year life, allowing for the hiatus of the Anglo-Boer War. The Van Ryn, another old company, shows a reduction of 385,000 tons, owing to higher working costs, to low values in one of the sections, and to the limited number of working faces available. Three other mines, the Wolhuter, Village Main Reef, and New Goch, have limited development faces, and show decreases of 215,000 tons in the case of the first named and of about 120,000 tons in the latter cases.

Some Other Far East Mines

Mines in the Far East tract, apart from the great advance shown by the Government Areas already referred to, show in the aggregate little change. Brakpan Mines figures are down by 550,000 tons, owing mainly to elimination of tonnage previously included, but which, as stoping progressed, proved to be below the commercial limit. It must not all be considered as definitely discarded. Springs Mines records a drop of 200,000 tons, in spite of an increase of 3 in. in stoping width.

An estimate made by Mr. Davis, who has succeeded Mr. Knecht as consulting engineer, confirmed the figures, but revealed the important fact that 1,117,000 tons was not available for stoping. Of this, 65,000 tons was in shaft pillars and 325,000 tons in haulage pillars. The remainder of 727,000 tons comprises blocks which will become available on the completion of subsidiary development or as stoping in contiguous areas progresses. It is the practice of the Central Mining-Rand Mines Group to state the block ore comprised in safety pillars, and some other companies mention ore partially developed, but it is usually an insignificant portion of the whole. The Geduld mine reveals an increase of over 300,000 tons in the ore reserve, Van Ryn Deep one of nearly 200,000 tons, and Modder Deep—the two latter among the most prosperous mines of the Rand—one of 130,000 tons.

The Village Deep forms a gratifying exception to the general run of decreases in bulk reserve. No less than 1,160,000 tons was developed during the year (practically double the quantity crushed). This is partly explained owing to the fact that the company secured rights from the government under Springfield Extension permitting ore partly developed to be transferred to the definite reserve. Unfortunately, it is accompanied by a decrease in value.

New Method of Determining Chromium

A new method of determining chromium is described by Terni and Malaguti in Gazz. Chim. Ital., 1919, 49, I., pp. 251-256, abstracted in Jour. Soc. Chem. Ind., Sept. 15, 1919. A solution of a chromic salt is boiled with 20 c.c. of nitric acid (sp. gr. 1.4) and about 1 gm. of lead dioxide until reduced to a few c.c. of water, and treated with sufficient sodium hydroxide solution (25 to 30 per cent) to redissolve the precipitate of lead chromate. The solution is heated nearly to boiling and filtered, and the residue washed with boiling water rendered slightly alkaline with sodium hydroxide. The filtrate is diluted to 150—200 c.c., and treated with nitric acid (sp. gr. 1.2), free from nitrous acid, until the lead chromate has dissolved, when a further 25 c.c. of the same acid is added. The solution is treated with 5—10 c.c. of 10 per cent potassium iodide solution, and the liberated iodine is titrated with a solution of sodium thiosulphate (about 25 gm. per litre), which has been standardized against N/10 potassium bichromate solution in the presence of 25 c.c. of nitric acid (sp. gr. 1.2). The method is applicable in the presence of iron, manganese, and aluminum.

Head-Box Capacity in Hydro-Electric Mine Power Plant

In hydro-electric mine power plants, the importance of having a large surplus supply of water in the head-box supplying the penstock is sometimes overlooked. Under normal operating conditions this surplus water is used to overcome peak loads that overload the power plant from 10 to 25 per cent. If the overload covers only a short period, one-half a minute to two minutes, or even a longer time, this surplus capacity will prevent drawing down the head of water in the penstock, with consequent loss of considerable head and a sharp, continuing drop in power output. If an excess of water is flowing into the head-box, a peak load operates merely to reduce the excess flow. The following table indicates the quantity of water per minute for 100 brake hp. or 125 water hp.:

QUANTITY OF WATER PER MINUTE PER 100 BRAKE HORSEPOWER (80 PER CENT EFFICIENCY)

Head	30	40	50	60	75	100	150	200
Water in Cu. Ft. per min.	2,210	1,650	1,320	1,100	880	660	440	330

Under low water conditions this surplus capacity of the head-box is especially important, for an overload may empty the head-box and penstock, necessitating a shutdown of the turbine. The best way of providing for the surplus capacity will be determined largely by the topographic conditions in the immediate vicinity of the head-box. The upper part of the head-box should provide for the surplus capacity. This is best obtained by making it as wide as possible, and, with this as one limiting dimension, to increase the length sufficient to provide an excess of water that will carry the maximum overload. The surplus capacity portion of the head-box should be as wide and as shallow as possible, so as to supply the excess volume of water with little loss of head.

Transvaal Gold Production in September, 1919, amounted to 698,558 fine oz., according to report by the Transvaal Chamber of Mines. This was a decrease of 8,111 oz., compared with August. Total for the first nine months of this year is 6,278,208 fine oz., compared with 6,440,949 fine oz. in the corresponding period last year.

Mine Accidents

English Speaking vs. Non-English Speaking Employees—Conditions that Retard Americanization of the Foreign-Born Worker—Importance of Adapting the Immigrant to His New Environment

BY ALBERT H. FAY,
Mining Engineer, U. S. Bureau of Mines.

THE employment of non-English speaking labor in American mines has been brought about by reason of the rapid expansion of the mining industry, beginning in the early 80's. The Americanization of this great body of labor, and its relation to accidents in the mining industry, are two problems of prime importance—the first as affecting citizenship and the growth of this Republic, and the second as an economic problem in mining costs. The former exerts an influence upon the latter, for the former implies education, social welfare, civic pride, and a general uplift to the ideals for which America stands. Ignorance, dirty and filthy living conditions, ill-health, disregard for law and order, discontent, and lack of civic interest lead to indifference and carelessness, perhaps the greatest of all accident causes. Eliminate carelessness and at least 50 per cent of the accidents will disappear from industries.

Immigration to American Mines

During the decade previous to the year 1880 (as well as in earlier years), the greater part of the employees in the coal and metal mines were Americans or representatives of the English, Scotch, Welsh, German, and Irish races.[1] The majority of the men of foreign birth had been in this country for some years previous to the great expansion of the mining industry which began about this time. English speaking miners continued to immigrate, and to find employment in the mines in large numbers, until about 1890. Since that year comparatively few immigrants from Germany and Great Britain have entered this industry, although Swedes and other Scandinavians have been constantly employed since the early 80's.

The employment, in the mining industry, of immigrants from southern and eastern Europe began about 1880. The Slovaks were the first arrivals, and immigrated in considerable numbers. They were followed within a year or two years by a few Magyars, and the number of immigrants of this race gradually increased each year. The Polish immigrants began to come about 1890, although individual members of the race had been coming for a period of nine or ten years. After the year 1890 Poles and Slovaks arrived in great numbers. A few Italians were employed before the year 1895, but the immigration of this race did not begin upon a large scale until about 1900. They were at first engaged in railroad construction and maintenance-of-way work, and gradually drifted into the mines.

Croatians were employed in some districts before 1890, and Serbians began to arrive in small numbers in the early 90's. The great bulk of all the immigration from southern and eastern Europe, however, has occurred within the last eighteen years. Russians, Bulgarians, Rumanians, Ruthenians, Syrians, Armenians, Macedonians, Croatians, Serbians, as well as Poles, Magyars, Slovaks, and Italians, have been among the recent arrivals. The races of southern and eastern Europe continued, up to the time of the war, to find employment in the mines in increasing numbers in almost every important mining district in the Eastern states and the Lake district. Many of these recent immigrants have found their way to the Central and Western states. As a result of the rapid expansion of the mining industry, many mining communities have been founded, the population of which are largely made up of immigrants who have arrived during recent years.

The pioneer American, English, Irish, German, Scotch, and Welsh miners are thus outnumbered and their positions filled by the more recent immigrants. It is not difficult to account for this racial change, which is still going on. The former operatives and their descendants had opportunities to secure more congenial and safer work in other industries. Many of them advanced in the industrial scale, becoming foremen and attaining other responsible positions. A large number have abandoned the occupation of miner for positions as day or shift men. Many also migrated and established themselves in the Middle West and Western states.

A considerable number of the former miners who left the industry entirely because of change in mining methods or the employment of immigrants entered mercantile, clerical, mechanical, or more pleasant work of other kinds. Many of the business and professional men in the mining towns were formerly mine workers. Their places were filled without difficulty with recent immigrants, who were content with the wages and working conditions which prevailed in the mines. The wages paid in American mines seem very attractive to the recent arrivals of agricultural laborers from southern Europe.

Failure of Native Born to Enter the Industry

Another noteworthy tendency is seen in the fact that the racial displacement has occurred not only through the departure from the industry of the former employees, but also through the refusal of their children to enter the industry and the attitude of the parents themselves, who frequently discourage them. Of the total native born, of fathers who were miners, a large percentage enter occupations other than mining. The conclusion from the

[1]Many of the statistics given herein are from "Immigrants in Industries," a report of the Immigration Commission, 1911, Senate Document No. 663, 61st Congress, 2d Session; Vols. 6, 7, and 16.

limited data, therefore, seems to be that though the foreign-born males of more than sixteen years of age, whenever employed, work in the mines, the persons native born of native father, together with the second-generation immigrants, are entering the mines only to a limited extent. This inference bears out in a large measure the experience of the mine operators, who state that the native born and the second-generation immigrants are not entering the mines in the same numbers as formerly and that the industry is receiving a constantly decreasing number of employees of these classes.

There exists a prejudice against recent immigrants, which also operates to an important extent in the displacement of former employees. Many Americans, English, Germans, Scotch, Irish, and Welsh did not and do not desire to be associated in the mines with the recent immigrant, and the feeling has become prevalent that a sort of reproach attaches to an intimate working relation with the foreigner. The races of former immigration have, therefore, left the industry and have entered other work, which, they feel is more dignified and congenial.

The relatively small number of American miners who remain in the industry must work side by side with the recent immigrant. To a greater or less degree the standard of safety in the mine is set by the demands of the ignorant and inexperienced immigrant, not by the more intelligent American, and the standard of life is decided to a large extent by those conditions which will be accepted by the same recent immigrant. In short, to work in the coal-mining industry, the American must compete with the recent immigrant, who, as a rule, is not particular as to the living and working conditions. These conditions, however, are in most cases far better than in factory towns where congestion prevails.

Another effect of recent immigration from central and southern Europe has been the preventing of the English, Irish, Scotch, and German immigrant from entering the mining industry. As already noted, these western European races were coming to the industry in large numbers prior to the early 80's, but began to decline toward the end of the decade and practically stopped about 1893 or 1894. There can be no question that the immigration of the Slovaks, Poles, Magyars, and other races operated to prevent the further coming of these older immigrants to the industry, precisely as it operated to drive out of the industry those already employed, together with the native Americans. There is, therefore, no incentive for the English or German miner to migrate to the mining regions and compete with the Slovaks, Croatians, Italians, and other foreign laborers.

Citizenship

A point of general interest is the tendency on the part of the different races of foreign birth working in the mining industry to acquire citizenship, and their general interest in public and civic affairs. The recent immigrant manifests little real or intelligent civic interest. This may be ascribed to his ignorance of our political methods, his inability to read or speak English, the social and political aloofness of these races in the more or less remote mining villages, and a desire to avoid taxation. Those who reside in or near the cities seem to exhibit more interest than do those of the isolated communities. It seems that the Bohemians and Moravians, 94 per cent of whom can read some language, take a much more active part in civic affairs than any other race of recent immigration in the bituminous districts of Pennsylvania. Among the other Slavic races, the Slovaks (82 per cent read) and Poles (77 per cent read) lead in this regard, whereas the Croatians (67 per cent read) make the poorest showing. It is almost the universal statement that this latter race shows little civic interest and that few become naturalized.

The Italians (81 per cent read), both North and South, are more active than the Slavic races in their efforts to become citizens, and appear to take a more active part in civic affairs. In cases where there seems to be encouraging civic activity it is nearly always due, not to their own intelligent efforts to attain citizenship and exercise its privileges, but to the influence of interested politicians, who in many cases may be leaders of their own race; for example, an intelligent banker and steamship ticket agent. It seems true of all the later immigrating races that they take far less interest in civic affairs than did the German (97 per cent read) and English (98.5 per cent read) immigrants.

The foreigner should be taught that the laws of America were made to protect, and not harass, every good citizen, rich and poor alike, and it is the duty of well-informed Americans to make this understood. If well-meaning foreigners, the making of good citizens, are left entirely to their own devices, they fall an easy prey to the designing I. W. W. and the Bolsheviki. Somebody who understands their language fully, and in whom they have confidence, should explain to them that they are being deceived so long as they listen to anti-American propaganda.

Church and the Immigrant

The church association between the native Americans and the southern and eastern European immigrants is limited. The general attitude of the native churches toward the immigrants is one of indifference, and there is a strong inclination in many communities to shun association with the immigrant in church activities. In many cases where missionary efforts are made by native churches of any denomination, services for the immigrants are held in barns, stores, or other unattractive places, thereby lessening the interest in them. The races from the southern European countries, which compose a large portion of the mining population, have been reared where there is no social caste in religious organizations, and have worshipped in buildings which are unsurpassed in beauty and grandeur the world over. When these people are offered services held in stores, barns, and similar buildings, their interest in the services naturally is slight, and they become indifferent. Lack of interest in church

affairs tends to decrease activities in civic matters. The church and its allied organizations can be an important agent in teaching immigrants the rudiments of the English language and pointing out to them their duties as American citizens.

Lack of Mining Experience on the Part of Recent Immigrants

Men of the races of the old immigration (western Europe) have been employed in the mines of the United States for many years. As a result of their experience, both in this country and abroad, they are far better qualified as miners than are the southern and southeastern Europeans. The older immigrants speak English, either as their native tongue, or, as in the case of the Germans and Scandinavians, because of long residence in this country. They may be treated in almost every respect upon the same basis as the American miners.

The employees of recent immigration, on the other hand, have been in the United States for so short a period that, even though it be assumed that they have been employed in mining ever since their arrival, they must have had only a brief experience at most in the mines of this country. The data further show that few of their number had mining experience abroad. Over 80 per cent of the Scotch and English miners had mining experience in their native country before entering the American mines, whereas of the south Italians and Croatians, less than 5 per cent have had mining experience. Most of the latter were farm laborers in their native countries. Upon coming to the United States they decided to follow the occupation of mining because the work was better paid than any other obtainable, although many of them had been here only a few months and many more only a year or two years. Under these circumstances it is not surprising that they know little or nothing of rock formations, of fire damp, of the properties of coal dust, and of the handling of explosives,—matters about which every coal miner should be thoroughly informed. To determine whether a piece of slate or roof is or is not likely to fall, often requires a considerable degree of experience, and the majority of the Slavs, Magyars, and Italians have not this experience.

Immigration in Its Relation to Mining Accidents

The mines are presumably less safe than they would be with native American, English, Irish, Scotch, Welsh, or German labor, because recent immigrants often accept more dangerous working conditions than the first-named employees. Furthermore, the later immigrants are ignorant and untrained, and are a source of danger to themselves and to the other workmen. Among the older mine workers the feeling is strong that the employment of non-English speaking races has complicated the problem of safety in the mines. They assert that carelessness on the part of recent immigrants, and the ignorance of those who are suspected of having obtained their places without having had the required experience as miners, have tended to render the mines less safe, and thus to increase accidents.

A large proportion of the deaths and injuries reported for the coal mines of the United States occur among the non-English speaking miners. The employees consisting of the races of southern and eastern Europe, having had little experience in mining either in this country or abroad, are particularly liable to accidents, and as the responsibility for accidents rests in many cases with the men injured, to state that they are particularly liable to accidents is in effect to say that they are responsible for a considerable proportion of all the accidents occurring in the mines.

The mine accidents for which the workmen are themselves responsible fall naturally into two classes—those caused by carelessness and those due to ignorance. As regards the first of these, it is probable that the foreigner is no greater offender than the person of native birth. Many of the Americans and other English speaking miners are undoubtedly reckless, and a large proportion of all the accidents occurring among their number seems to be attributable to this cause. Grave risks are often incurred for the sake of avoiding a little extra labor. Props are left unplaced, open lamps are used instead of closed lamps, cars are driven in a careless manner, explosives are handled recklessly—all in defiance of the most elementary rules prepared by men of long experience in the industry.

Among the recent immigrants, on the other hand, many of the accidents are unquestionably due to ignorance, for by reason of their lack of experience, they do not see nor realize the dangers that confront them; nor do they readily comprehend the necessary precautions that must be taken to make their working places safe.

Lack of experience in the mines has a marked effect upon the high accident rate, as indicated by a study of accidents among the immigrants whose experience in mines, before coming to this country, was known. The fatal, serious, and non-fatal injury rates in the coal mines of Pennsylvania and West Virginia are approximately 14.5 per 1,000, for those of whom 10 per cent had mining experience prior to coming to the United States. The accident rate for those of whom 10 to 20 per cent had mining experience is about 12 per 1,000, showing a rapid decrease as mining experience increases. It would seem from this though their experience is limited, these immigrants soon gain sufficient knowledge to use a certain amount of caution, thus giving a decline in accident rate.

Carelessness of Experienced Miners

As contrasted with the decrease in accident rates among those of whom 5 to 30 per cent have had mining experience, the accident rate based on similar data for those of whom 50 to 60 per cent have had mining experience prior to coming to this country is 10.5, whereas the rate is 12 for those of whom 80 to 90 per cent have had experience in the mines—a marked increase with the extra experience. This is due largely to the tendency of those with considerable experience to become more or less careless or reckless and to think that they can slight certain

features of work without an accident. A new man entering the mine would not consider for a moment crimping a cap with his teeth, whereas many of the men who have been in the mines for eight to ten years would not hesitate and do not hesitate to crimp caps with their teeth. Other instances of carelessness might be cited. The available data, therefore, seem to indicate that inexperience is responsible for many accidents, and that a little experience begets much caution on the part of the recent or new employee. As indicated, there is thus a tendency toward a rapid reduction in accident rates to a point where between 30 to 40 per cent of the employees have had mining experience. Beyond this percentage, caution wanes and is replaced by carelessness, with a resultant increase in accidents. The green miner may be over-cautious, but he lacks experience. The seasoned miner has the experience, but too often caution is replaced by carelessness. Caution combined with experience will go far toward accident reduction.

Another element of danger is contributed by the fact that few of the recent immigrants speak or understand English, and almost none are able to read or write the English language, and placards of warning do not reach them. It is probable that the instructions of the mine bosses and inspectors are, because of this fact, frequently misunderstood. An inspector, for example, tells an immigrant miner, in English, of course, that his roof needs propping. The miner seems to understand, but does not, and a fall results.

In some mines printed signs are used to indicate the presence of gas or other peril. These signs are quite unintelligible to most of the foreigners. A common language is absolutely necessary in every safety-first campaign. Accident rates are much lower in England, France, Belgium, Germany, Austria, and Japan than in the United States. In these countries but few foreigners are employed, a common language being used in each country. The difference in fatality rates cannot be entirely attributed to the lack of mixed languages, but certainly a large percentage of the accident reduction may be attributed to the "common language" mines.

A comparison of accident rates with the ability of the miner to read some language or to speak the English language shows that the ability to read, although it may not be English, has a greater influence on accident reduction than the ability to speak English. This may be accounted for by the fact that ability to read develops a higher degree of intelligence and places the employee in a better position to realize dangers more readily than one who cannot read. Furthermore, if he is able to read, he is more likely to heed danger signs put up in certain places.

The recent immigrant, because of his lack of experience, his inability to speak English, and his keenness for earning money, is often willing to work in places where more experienced or more intelligent men would refuse to work. For the same reasons he will frequently be satisfied with and accept mine equipment too defective for safety.

Comparative figures by occupations, based on the payroll of ten typical coal mining companies in Pennsylvania, show that about 33 per cent of the English speaking employees are employed as pick miners, as compared with about 52 per cent for the southeastern Europeans. As a matter of fact, from trackman to loader, the English speaking employees represent about 61 per cent of the total, as compared with 82 per cent for the southeastern Europeans. These figures, therefore, indicate that the non-English speaking foreigner is employed in the most hazardous of the mine occupations; hence one reason for the higher accident rate.

Accidents by Nationality, in Pennsylvania and West Virginia

In the Pennsylvania anthracite mines 43 per cent of the employees are English speaking, and this number is charged with only 28.8 per cent of the fatalities, whereas the other 56 per cent (representatives of Continental Europe) sustained 71 per cent of the fatalities. Likewise in the Pennsylvania bituminous mines the English speaking employees represent 35 per cent of the total and are charged with 27 per cent of the fatalities, whereas the other 65 per cent (representatives of Continental Europe) are charged with 73 per cent of the fatalities. As regards the figures for West Virginia, the English speaking employees represent 67 per cent, and, notwithstanding the fact that this includes 17 per cent of colored employees, only 53 per cent of the fatalities are charged to the English speaking employees, whereas the other 33 per cent sustained 47 per cent of the fatalities. Almost the same ratio holds for non-fatal injuries in the three groups of mines cited.

Had the fatality and injury rate for the English speaking American been maintained throughout the three groups of mines, there would have been a saving of 716 fatalities and 900 serious injuries, a strong argument for Americanization and education of the miner.

The Permeability of Zinc Retorts

Experiments on the permeability of zinc retorts, reported in an article in Metall und Erz, Vol. 16, pp. 323-326, and abstracted in the "Journal of the Society of Chemical Industry," showed that with increasing pressure in the retort less gas flows out of the condenser, and not only the amount but the nitrogen content of the retort gases decreases. Using a new retort and diminishing the pressure in the furnace, the permeability decreases toward a minimum value, with increasing density of the walls of the retort, due to shrinkage and to formation of a skin of silicate. Penetration of certain components of the gases of combustion leads to the formation of larger quantities of zinc dust, which tends to stop up the muffle and condenser, and the increase in pressure in the distillation apparatus inducing diffusion of the gases of reduction into the combustion chamber causes greater metal loss.

The Use of Naphthylamin and Xylidin in Flotation

Improved Recoveries and a More Easily Dewatered Concentrate Result From Substitution of These Chemicals for Oil in Several Western Mills - No Special Apparatus Required—Crude Compound Is Known as X-Cake

BY EDWARD H. ROBIE

THE study of the agents used to secure a mineral-bearing froth forms one of the most interesting branches of the technology of the flotation process. In the vast amount of experimental work that has been done in flotation, more attention has been given to this subject than to any other, for every investigator has been anxious to find the one oil, or whatever it may be, that will give the best results. Two general classes of substances have been demonstrated to possess the widest field of usefulness in practice. One of these, the coal and petroleum distillates, has been found to be suitable as "collecting oil" to coat the sulphide particles. The other class consists of the volatile constituents obtained in wood distillation. These substances, agitated with ore pulp, form a foam or froth in which the "oiled" mineral particles are carried upward.

Some years ago Colonel William Boyce Thompson and associates established a fellowship at the Mellon Institute of Industrial Research at Pittsburgh, for the investigation of the flotation process and of the reagents which might be used in this connection. A large number of experiments were carried out, and, among the numerous compounds tested, certain coal-tar derivatives were found to give particularly good results when used in laboratory flotation machines. The most promising from all standpoints was crude alpha-naphthylamin, which could be used alone as a flotation agent, apparently functioning as both a collector and a frother. After the laboratory tests had been completed, this compound was given a trial on a commercial scale at the experimental plant of the Magma Copper Co.

Alpha-naphthylamin being a somewhat unwieldy name, the term "x-cake" has been adopted for the crude product, and it will be so called hereafter in this article. The raw material for its manufacture is naphthalene. This is first treated with a mixture of sulphuric and nitric acids to form nitro-naphthalene, from which x-cake is produced by reduction, usually by the use of iron turnings and hydrochloric acid. X-cake is a non-oleoginous solid, melting, when pure, at 122 degrees F. and boiling at 572 degrees F.

Discovery of Xylidin as a Flotation Agent

The problem of solution made the use of x-cake somewhat difficult in the ordinary flotation mill, as large tanks had to be provided and steam furnished for heating. No particular difficulty was encountered once the apparatus was set up, but the ordinary millman does not care to go to much expense in trying out a new flotation agent. In view of these conditions, the problem was attacked of finding something similar to x-cake in metallurgical results, but more convenient to use, requiring a minimum of change in the standard methods employed by mills using oils as flotation agents. Several substances appeared promising in further trials at the Mellon Institute. The conclusion was reached that crude xylidin met the requirements better than any other substance of the kind. In itself it is not as good a flotation agent as x-cake, but when mixed with the latter excellent results are obtained. The x-cake is easily soluble in xylidin and the solution is a liquid of such consistency that it can be handled easily in any of the usual oil feeders with which all flotation mills using oils are equipped. No changes in the flow sheet are necessary, the x-cake-xylidin mixture being simply poured in after the oil tanks are emptied.

Crude xylidin is a liquid made up of different xylidins which have the same ultimate chemical composition but differ from one another in the arrangement of the atoms in their molecular structure. It is manufactured from xylol in much the same manner as is x-cake from naphthalene.

The favorite proportions for the mixture are 60 per cent x-cake and 40 per cent xylidin, but these can be varied considerably. If the pulp feed to the cells is reasonably warm, and the flotation agent is introduced at such a point that it may become thoroughly mixed with the pulp before entering the cells, less xylidin may be used. The addition of the mixture to the ball-mill feed is not necessary in any case; commonly it is added in the launder preceding the first flotation cell. The mixture is non-volatile, non-inflammable, and chemically inactive. X-cake has a very offensive odor, which, strange to say, is most disagreeable when very slight. In mills where it is employed, the odor is neither objected to nor noticed, but the odor from the small amount which will be picked up by a shoe sole in walking through a mill where x-cake is used will be noted in a large room. The mixture of x-cake and xylidin may be made by putting the proper proportions of the two substances together in a suitable container and heating and stirring for a few minutes. Heating is unnecessary if the lumps of x-cake are broken up and the mixture allowed to stand for a day or two with occasional stirring.

Neutral or Alkaline Pulp Is Preferred

Experience with these agents has shown that a neutral or slightly alkaline pulp is necessary for the best results. This has usually been accomplished by adding a small amount of lime to the ball-mill feed at intervals of five minutes or so. This, however, has been found to have certain disadvantages, as it tends to form crusts on the tables, if the latter

are used before flotation, and also the canvas cell blankets require more frequent cleaning than when lime is not used, acidulated water being used for scrubbing. The addition of the lime to the settling pond which furnishes the return water has been found more advantageous. Any precipitation caused by the lime will then be made in the pond, and still the mill water will have the neutrality or slight alkalinity desired.

When operating with x-cake-xylidin, economy requires the use of the largest possible amount of return water. Flotation operators have found that when oils are used in a closed circuit only a little less oil is required than when the mill-feed is made up entirely of new water. The insoluble parts of the oil are probably lost entirely, and only a part of the soluble constituents is returned to the cells with frothing properties unimpaired. With x-cake, this has not been found to be the case. Whatever amount is returned in the water from concentrate or tailing seems just as efficient as ever. Apparently little or no deterioration occurs in settling ponds, although the water gradually turns a dark brown. Considerably less of the agents under discussion are therefore required if the make-up water is kept at a low proportion of the total.

X-Cake First Used by Magma Copper Co.

The first test of x-cake on a commercial scale was made at the mill of the Magma Copper Co., Superior, Ariz. Results have been so satisfactory on the bornite-chalcopyrite ore that it is still being used there, a solution apparatus having been erected so that xylidin is not required. During the year 1918 the results obtained by the use of x-cake in the Magma mill were as follows: Feed, 4.50 per cent cu.; tailing, 0.35 per cent; concentrate, 10.78 per cent; recovery, 95.33 per cent. Besides the high recovery shown by these figures, some operating advantages have resulted from the substitution of x-cake for oil. In handling the concentrates with vacuum filters the time of filtering was reduced to one-sixth, or less, of the time necessary for filtering oil concentrates, and a drier filter cake is also obtained.

Last year, tests were carried on at Superior with a mixture of x-cake and xylidin. The mixture gave a slightly more voluminous froth than had been obtained with x-cake alone, but this was the only noticeable difference. The metallurgical results were practically identical, and so, on account of the slight additional cost of the mixture, the use of straight x-cake was continued.

X-Cake and Xylidin Displaced Oil at the Consolidated Coppermines Mill

The mixture of x-cake and xylidin has been commercially applied at the mill of the Consolidated Coppermines Co., Kimberly, Nev., and at the mill of the Arizona Copper Co. at Clifton. At the former plant, the flotation department operated until Sept. 1, 1918, with a mixture of coal tar, coal tar creosote, and pine oil. After Sept. 1, x-cake-xylidin in alkaline circuit was used to the extent of a little less than ½ lb. per ton of ore. The copper occurs as chalcocite, with some chalcopyrite and oxidized mineral.

The following table shows a comparison of the results obtained with oil as against the x-cake-xylidin mixture:

CONSOLIDATED COPPERMINES MILL DATA

	Using Oil	Using X-cake-Xylidin
Mill Feed		
Per cent Cu	1.19	1.34
Ounces Au	.02	.02
Ounces Ag	.06	.07
Per cent SiO_2	87.1	85.9
Per cent Al_2O_3	1.5	2.5
Per cent Fe	3.5	3.7
Per cent CaO	2.1	2.5
Per cent S	2.1	2.5
Mill Tailing		
Per cent Cu	0.28	0.21
Ounces Au	.01	.01
Ounces Ag	.04	.04
Per cent SiO_2	91.5	90.1
Mill Concentrate		
Per cent Cu	13.62	18.33
Ounces Au	.14	.21
Ounces Ag	.33	.44
Per cent SiO_2	27.3	13.5
Per cent Al_2O_3	7.2	4.5
Per cent Fe	20.9	27.6
Per cent CaO	1.3	0.3
Per cent S	22.9	32.1
Recovery		
Cu	78.22	82.31
Au	52.95	69.30
Ag	38.11	40.34
Ratio of concentration	14.68	17.00
Per cent H_2O in conc.	17.15	9.39
Cost of flotation agents per ton milled	7.46c.	15.6c.

1. A smaller tonnage of concentrate was dewatered and handled in the mill.

2. A smaller tonnage of concentrate was treated by the smelter, cutting freight and treatment charges per ton almost in two.

3. The higher-grade concentrate was made largely by the elimination of colloidal matter, giving a more granular product. This, combined with the smaller tonnage to be handled, made it possible to filter the concentrate in one shift with one or two filters, whereas with the old concentrate, produced with coal-tar reagents, three shifts with three filters were required to handle the concentrate produced.

4. Owing to the more granular nature of the concentrate, a thicker, dryer cake was produced by the filters, thus saving freight on moisture.

The Arizona Copper Co., which has a 4,000-ton concentrating plant at Clifton, Ariz., is now using x-cake and xylidin in the entire mill. The use of these compounds was decided upon after a careful test, the results of which showed sufficient improvement over those obtained by the use of oil, to justify the additional cost of the new agents.

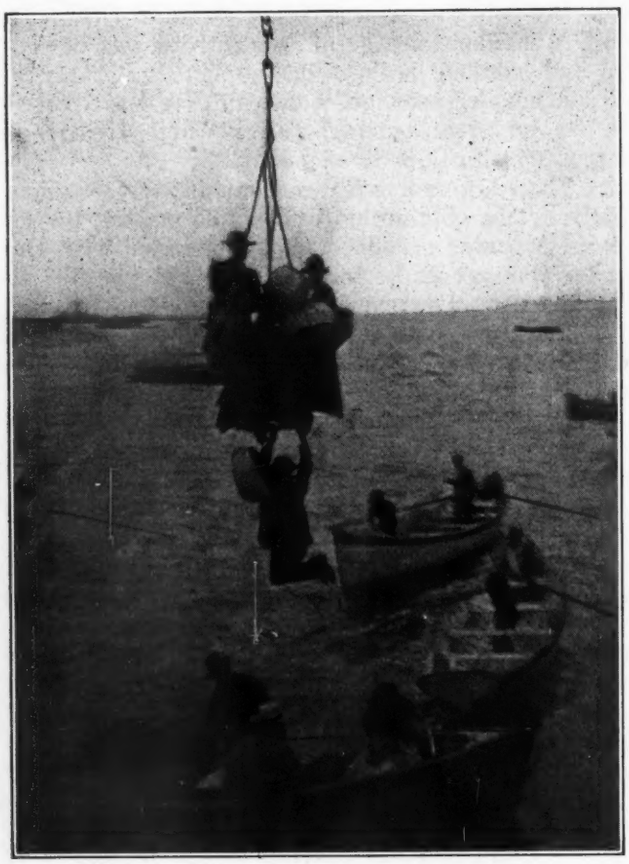
In general, x-cake froths are much more easily broken down than oil froths and the thickened concentrate is more readily filtered. Improved recovery is obtained on many ores, particularly those containing considerable colloidal matter. The cost of the x-cake-xylidin mixture per ton of ore treated is in general greater than that for the oil mixtures commonly employed.

X-cake and xylidin are manufactured by several companies, among whom are the Barrett Co., the Newport Chemical Works, the Butterworth-Judson Corporation, the Calco-Chemical Co., and the National Aniline and Chemical Co., all of whom have offices in New York City. The price of 60 per cent x-cake-40 per cent xylidin mixture, in tank-car lots, is 35c. per lb., f.o.b. New York. A royalty of 2½c. per ton of ore treated by the agents named is also payable.

In view of the results which have been obtained with x-cake-xylidin in pneumatic flotation cells, they will no doubt find considerably wider commercial application. X-cake-xylidin can easily be tested in a commercial mill or in a laboratory flotation machine, but it must be remembered that when the agent is not present in the return water, a greater quantity will be required. Oils giving excellent results on one kind of ore are not necessarily adapted to another, and the probability is that x-cake will also find its commercial application limited to those classes of ore in which recoveries or concentrate handling charges can be materially improved by its use.

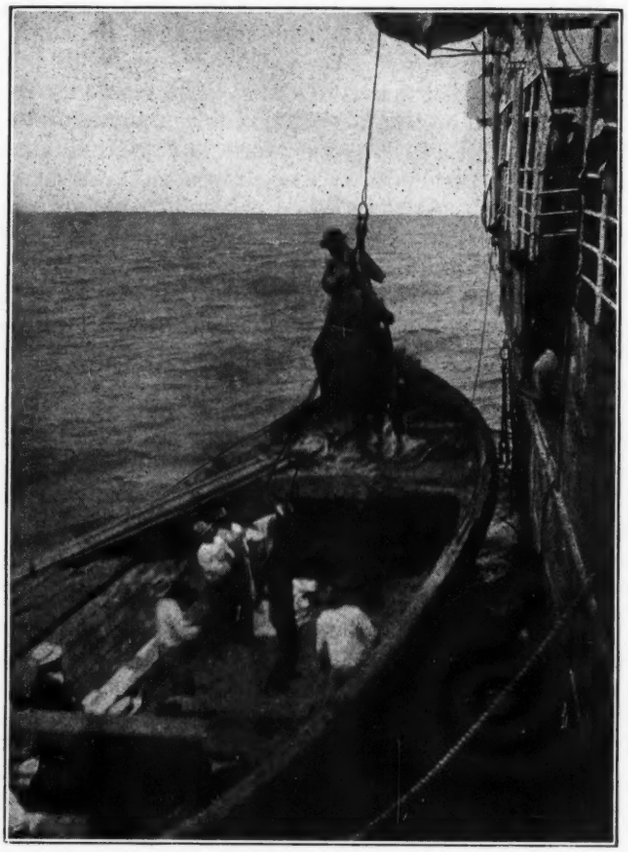
Difficulties of Unloading Merchandise in South American Ports

The following illustrations contain suggestions of value to mining men in regard to the shipment of material to South American or other ports where facilities for the discharge of cargoes are limited.



DISEMBARKING AT MOLLENDO, PERU

One illustration shows the method of disembarking passengers and merchandise at Mollendo, Peru, which at present is the only available means. It clearly portrays the difficulties involved, and perhaps will suggest precautions which could be taken in the method of boxing to prevent damage to machinery or perishable merchandise. Frequently, because of the contour of the shore line, the sea is rough and the goods are exposed to the danger of becoming water soaked. Furthermore, increased bulk and weight render the operation more difficult. The other illustration shows passengers going aboard at Salaverry. The illustrations are reproduced through the courtesy of H. Secchi, of W. R. Grace & Co., New York.



METHOD OF PUTTING PASSENGERS ABOARD AT SALAVERRY

An American Miner

I feel sure that there are quite a number of mining men, like myself, willing and in a position to lend their services to help the country through this crisis by service with the coal mines. Personally, I am a good miner. Have worked in that capacity throughout the continent in a considerable variety of metal mines, but never in a coal mine. At present I am ready to serve as miner in the coal mines, but am ignorant as to where my services would be most acceptable. A little direction by you in this line might induce a number of good miners and patriotic men to volunteer their services at this time when they are most needed. A notice in your issue to this effect might be of value, and for my own part any direction which you can give me as to where I might apply to advantage for employment as a coal miner would be appreciated by me, and I trust would be a service to the country.

Allow me to congratulate your publication for the splendid stand it is taking against the Nihilist movement which is now shaking the civilized world.

Arthur O. Christensen.

Beaufort, S. C., Nov. 7, 1919.

New Angles to the Apex Law*

Exceptions of Known Veins From Land Patented as Placer Renders Titles Uncertain—Community Injured by Such Instability—Exchange of Placer Patent for Lode Patent Must be Safeguarded To Prevent Loss of Rights

BY JOHN A. SHELTON
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ONE of the heaviest burdens uselessly cast by our mineral laws upon the holder of the title by a patent from the United States is due to the provision excepting known veins from land patented as placer. In many instances the expense of defending such titles from the assaults of the owners of lode locations, made upon the theory that the veins so located were known to exist at the date of the placer application for patent, has exceeded many times the value of the land in question. Neither the lapse of time, however long after the issuance of the patent, nor repeated adjudications by the courts serve to quiet such titles or to prevent them from being questioned.

In the passage of laws providing for the acquisition of the title to the mineral lands of the United States, Congress provided that the title to known veins should not pass from the United States by a patent based upon a placer location. As constructed by the courts, the law (Sec. 2,333 R. S. U. S.) provides that the applicant for a patent upon a placer claim may, if any vein of sufficient value to justify the expenditure of money in its development is known by him to exist within the boundaries thereof, include in his patent application an application for patent upon this vein as a lode claim; and failure to do so is to be deemed a conclusive declaration that the applicant makes no claim to the vein nor to an area of surface ground extending for 25 ft. (7.6 m.) on each side of its middle or center. As to such vein and such area of inclosing surface ground under the circumstances stated, the title remains in the United States, notwithstanding the issuance of a patent that purports to convey the entire surface of a described area and everything beneath it, excepting only the segments of veins the apices of which lie outside of such area. Such known veins, with such area inclosing surface ground, are, of course, at any time, so long as they remain unlocated, subject to location and appropriation in the same manner as other veins upon the public domain.

Bad Effect of the Law Demonstrated in Butte

The history of the operation of this law in one district will serve to illustrate its effect generally throughout the mining regions of the United States. In the Butte district, the mineral that first attracted the attention of the miner was placer gold and not until some years later were attempts made at quartz mining. A few years after the discovery of mineral, practically the whole district, embracing several square miles of territory, was covered with mineral locations, upon which patents were afterward issued. Roughly speaking, the low-lying land along Silver Bow Creek and its branches extending part way up the slope in the direction of the Butte hill comprised the portion of the district within which the placer-mining operations were carried on. There the surface and subsurface for several feet generally consisted of loose earth and gravel or boulders in which was found the deposit of placer gold and beneath which was the solid formation or bedrock. As to that land covering about one-half of the district, the patents issued were placer patents or patents based upon placer locations. Though the apices of the veins showed in the surface of bedrock generally throughout the whole district, their existence in ground covered by placer wash could not have been known until bedrock was exposed by the removal of the placer wash in the placer-mining operation or otherwise. When discovered in the early days, they were not generally considered worth development. Frequently they did not contain mineral, on or near the surface, that could be profitably mined. Later development showed that many veins carrying little mineral at the surface were rich in copper at depth, after which it became a practice in the district to sink on veins that had no showing of surface mineral, with the hope of discovering paying ore at depth. As time went on, copper smelteries were built and underground explorations were extended, and it was proved that some of the veins in ground held under placer patents were of considerable value because of the facilities then existing for the treatment of ore of such character. This circumstance, coupled with the fact that the surface had in many instances been built upon and improved, and had greatly increased in value, furnished the inducement to lode claimants to appropriate and obtain title to veins held under placer patents.

The litigation resulting has been carried on more or less continuously ever since, and, after a lapse of forty years from the issuance of the placer patents, still continues. As the title to all veins known to exist at the date of the placer application for patent remained in the United States, no statute of limitations would bar such suits; and as a judgment in one suit will bind only those who are parties to it, or their privies, a judgment in favor of the placer owner in one suit does not prevent a new lode location by another party, and a new suit concerning it. The judgment in such cases in every instance rests chiefly, if not solely, upon the determination of a question of fact; namely, whether or not the vein in question was a vein known to exist; that is, whether or not it was known to exist by the applicant for placer patent at the date of his application and was, under the then prevalent conditions, of sufficient value to justify exploitation and development. In every case it is necessary to call those as witnesses

*Presented at the Chicago meeting of the A. I. M. E., Sept. 22-26.

who at the date of placer application possessed such knowledge of the ground in question as qualified them to testify whether or not the vein was known to exist. Upon this point the testimony generally consisted of either affirmative or negative statements as to whether or not the vein outcropped on the natural surface of the ground or was exposed by the removal of the placer wash, so that its existence was known prior to the date of the placer application and visible to the placer applicant, and whether, if it was known, it was of such character that it would have justified exploitation and development under the conditions then existing.

Outcome of Such Litigation Uncertain

As might naturally be expected, those who were called as witnesses in any particular case were in direct conflict in their statements upon such questions. It is scarcely necessary to remark that in many instances the witnesses testifying were mistaken as to the matters concerning which they testified, and, such is the weakness of human nature, in other cases their testimony appeared to be knowingly false. As the litigation concerning such question was carried on, those who were called as witnesses became divided into hostile camps. Partisanship was not confined to those testifying as witnesses. The sentiment in the community concerning the merits of such controversies was divided. Under such circumstances it is not surprising that the outcome of such litigation was, in most cases, uncertain. Occasionally different courts gave directly opposite decisions. To illustrate, a portion of one vein was involved in litigation in a case in the Federal court and an adjacent portion of the same vein was involved in litigation in a state court. The two portions were covered by different lode locations, both included within the same placer patent. The testimony relied on in each case was substantially the same, but the decision in one case was in favor of the known existence of the vein at the date of the application for the placer patent, and in the other case it was against such known existence.

The importance of the stability of titles is recognized by everyone. It is needless to point out that if the title is uncertain, development of the property is in consequence discouraged. As a large proportion of the titles acquired under the mineral laws of the United States are held under placer patents (so called), the effect of such uncertainty of title in the sections of the country where such titles are held is very considerable and must necessarily retard the development of those sections.

Uncertainty as to Titles Injures Community

Although what has been said about the importance of the stability of titles acquired and held under patents of the United States is everywhere recognized, it is also true, probably, that a large proportion of the people are not conscious of the extent to which the prosperity of the community may be unfavorably affected by such uncertainty of titles. It is possible to gain a better conception of such effect by considering a similar, though extreme, case. Much of the land of Mexico is more fertile than any land of the United States. The country is richer in its deposits of oil and minerals, and it has, besides, a great capacity for the production of rubber, for which there is a great and constantly increasing demand. In a word, Mexico is potentially a richer country than ours. But, with all of such natural wealth, a large proportion of the Mexican people are in a pitiable state of abject poverty. There is no reason why they should be, except for their government or lack of government, and uncertainty of title is one of the principal consequences of their unstable government.

It is certainly true, though the confession is decidedly humiliating, that by reason of the provision which excepts veins known to exist from land patented as placer, and because of the lack of a provision by means of which any such defect may be cured or an attack upon the placer title barred by the lapse of time, a portion of the territory of the United States has been, to a limited extent, Mexicanized. Congress has been asked to pass a law that would prevent an attempted lode location upon ground patented as placer after the expiration of some fixed limit of time from the issuance of the placer patent; but for some reason no relief has been given.

The title held under a placer patent covering land within which there is a vein sufficient to support a lode location is uncertain, and cannot be rendered otherwise.

Exchanging Placer Patent for Lode Patent

In procuring a lode patent to be issued covering land as to which a placer patent has already been issued two different courses have been followed. While the placer patent is outstanding, whatever land was conveyed by it has passed from the public domain and is not subject to disposal by the Government, and an application for a second patent upon the same land will not be entertained by the Land Department of the Government. There is nothing, however, to prevent the officers of the Land Department from accepting, on behalf of the United States, a deed from the owner of the placer title conveying back to the Government whatever was conveyed by the placer patent, and the land, having been in that manner restored to the public domain, is again subject to disposal by the Government, and the necessary preliminary steps having been taken, a lode patent covering the same ground may be issued.

In practice, the placer owner, in following such course, may first make a lode location or locations covering the ground, perhaps embracing in a single location the same extent of surface area as in the case of a lode location made upon unpatented land. Then, having in other respects complied with the law entitling him to a patent upon his lode claim or claims, application for such patent is filed and with it a deed is tendered conveying to the United States the title conveyed by the placer patent or such part of it as is covered by his lode location or locations. In the absence of any adverse claim, the Land Department will treat such location as though made

upon unpatented land, and, the deed being accepted, there is no longer an outstanding patent and no obstacle to the issuance of a second patent.

Of course all precautionary measures necessary to prevent a loss of rights are taken. The deed tendered becomes effective only when accepted by the Government. Immediately upon its acceptance, the placer owner makes a lode location covering the ground for the purpose of preventing an adverse location by some other person, upon the theory that until the acceptance of the deed the land was not subject to location.

If within the land covered by the placer patent there is a vein that was, in fact, known to exist at the date of the placer application, the titles to such vein and to an inclosing strip of surface ground fifty feet in width in the United States, and the placer owner, equally with any one else, may locate it as a lode claim and, by performance of the acts required by law to enable him to procure patent, may procure the issuance of a lode patent on such location in the same manner that patent is procured upon a lode claim made outside of the limits of ground patented as placer, except that in connection with the application for patent, satisfactory proof must be furnished the Land Department, by affidavit or otherwise, of the known existence of the vein, and except, of course, that the extent of area that may be embraced in such location is limited to twenty-five feet on each side of the middle or center of the vein. If the question of the known existence of the vein is involved in doubt, the placer owner may proceed upon the theory that it was known, provided that satisfactory evidence is procurable to the effect that it was known.

When such a lode location is made by a person other than the placer owner, and judgment is recovered in his favor against the owner of the placer title that such vein was known to exist, and such lode locator then institutes proceedings to procure patent, such judgment is entitled to be given a conclusive effect in the Land Department, as elsewhere, upon the question of the known existence of the vein, and may be relied upon as proof of such fact, dispensing with the necessity of affidavits.

If such judgment is rendered as the result of a compromise of a lawsuit, or is rendered in a suit in which the placer owner does not resist the demands of the lode claimant, such facts in no way affect the question of the effect to be given such judgment. If the placer owner has a good title, but allows it to be taken, the United States or any private individual is not thereby the loser, and if his placer patent did not convey title to him, and the title remained in the United States, the vein was subject to location, and its locator upon compliance with the law is entitled to a patent to it.

Of course, the owner of the lode patent has extralateral rights, though the owner of the placer patent has not, and assuming that the vein was in fact not known to exist, the lode locator who procures a lode patent on it on the theory that it was a known vein thereby may procure a greater right in the vein than was held by the placer owner. The segments of any veins lying outside the placer boundaries, the apices of which are within the placer boundaries, which veins were not known to exist at the date of the placer application for patent, of course do not belong to the placer owner, but the title thereto is in the United States, and they are something, therefore, which the placer owner does not lose by allowing such judgment to be taken against him, and the lode locator does acquire them by his lode location and patent. The fact remains, however, that the recovery of the judgment affects the rights of no one except the lode locator and the placer owner, for such segments of veins are not, as something separate and distinct from the veins of which they are a part, subject to appropriation by private individuals or to disposal by the United States under existing laws.

October Mining Dividends

Dividends disbursed in October, 1919, by 16 United States mining and metallurgical companies making public reports, amounted to $4,792,394, as compared with $5,628,584 paid by 29 companies in October, 1918. Canadian, Mexican, and Central American companies paid $1,450,918, as compared with $1,131,950 in October, 1918. The only holding company to pay this month was the California Exploration Co., which disbursed 1s. per share (about $28,140).

Homestake Mining Co. found it necessary to omit its dividend in October after a long record of continuous payments. The rate on the common stock of United States Smelting, Refining, and Mining Co. was increased to $1.50 per share. Tonopah Belmont reduced from 10c. to 5c. per share, on account of the strike.

MINING DIVIDENDS

United States Mining and Metallurgical Companies	Situation	Per share	Total
Am. Smelters, pfd. A	U. S.-Mex.	$1.50	$146.071
Am. Smelters, pfd. B	U. S.-Mex.	1.25	39,855
Caledonia, l.s	Idaho	.01	26,050
Fairview Round Mountain, g	Nevada	.02	19,049
Golden Cycle, g	Col.	.03	45,000
Inspiration, c.	Ariz.	1.50	1,772,951
Iron Blossom, l.s	Utah	.02½	25,000
Phelps Dodge, c	U. S.-Mex.	.87½	425,555
Portland, g.	Col.	.02	60,000
Shattuck Arizona, c	Ariz.	.25	87,500
Tonopah Belmont, g.s	Nev.	.05	75,000
Tonopah Ex., g	Nev.	.10	128,280
Tonopah Min. g.s	Nev.	.15	150,000
United Eastern, g.s	Ariz.	.07	95,410
U. S. Smelting, com	U. S.-Mex.	1.50	526,673
U. S. Smelting, pfd	U. S.-Mex.	.87½	425,555
Vindicator, g.s.	Col.	.01	15,000
Wolverine, c,	Mich.	.50	30,000

Canadian, Mexican and Central American Companies	Situation	Per share	Total
Asbestos Corpn., com	Que.	$1.25	$ 37,500
Asbestos Corpn., pfd	Que.	1.50	60,000
Cons. Min. & Sm., c.z.l	B. C.	.62½	261,936
El Oro Min. & Ry., g.s	Mex.	.24	278,343
Hollinger, g.	Ont.	.05	246,000
Home Sound, c	Can.-Mex.	.05	99,208
McKinley-Darragh-Savage, s	Ont.	.03	67,431
N. Y. & Honduras Rosario, g.s	C. A.	.50	100,000
Nipissing, g.s	Ont.	.25	300,000

The totals for the first ten months of 1919 are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, $77,339,463 ($135,030,615); holding companies, $1,141,578 ($1,718,438); Canadian, Mexican, Central and South American companies, $13,873,152 ($15,202,875).

PETROLEUM SECTION

Engineering Notes and Equipment Details
Production Statistics — Progress
in Important Fields

British Petroleum Policy

Control Sought by Great Britain of Oil-Producing Areas of Canada, Trinidad, Persia, North Borneo and of All Prospective Petroleum Territory of the Empire

BY A LONDON CONTRIBUTOR

FOR a number of years Great Britain has been slowly maturing plans having for their object the domination of the world's oil supplies. Great Britain needs oil for her navy, for her mercantile marine, and for her industries, and the demand is that the sources of supply should be under British control. In this the British Admiralty has led the way.

For example, in the early exploration of Trinidad it was possible for American companies, either directly or through British subsidiaries all of whose stock was frankly owned by Americans, to obtain oil rights on Crown lands in Trinidad. The General Asphalt Co., of Philadelphia, which through a British subsidiary operating the Pitch Lake, was already established in the island, secured rights to 2,500 acres about 1909. The company has been refused further areas, and no American company can now secure oil rights in Trinidad, either directly or indirectly.

In 1912, the British government put into force in Trinidad a form of lease containing clauses referred to in the government departments as the "Admiralty Clauses," which require that any company holding a lease must be a British company, with the chairman, the majority of the board, and the managing director, British, and that "neither the lessee nor the premises, liberties, powers, and privileges granted, or any land occupied for any purpose under the lease, should, at any time, be or become directly or indirectly controlled or managed by foreigners or a foreigner or any foreign corporation or corporations."

Under this form of lease exclusive exploration rights for oil over about 200,000 acres were granted to the United British West Indies Petroleum Syndicate, Ltd., composed of representatives of the Burma Oil Co., Royal Dutch Shell, and a British investment house. Subsequently, a similar area was granted to a company organized by S. Pearson & Son, Ltd.

During the first year of the war, the policy crystallized to cover all British possessions so far as the home government had any power, and was so extended as to secure oil lands in other countries. The policy was adopted not only with respect to the war, but for the period after the war, that no rights would be granted in any British possession except to a British company whose antecedents, and particularly whose thoroughly British character or control, were entirely satisfactory to the specially created department called the Petroleum Executive, which was responsible to the War Cabinet and which was placed in charge of Professor John Cadman, since made Sir John Cadman. This special Petroleum Department has, among its objects, to control the granting of oil rights in the British Empire, and to assist British companies in securing concessions in other countries. The department has been energetically and systematically canvassing the potential oil possibilities of the world and suggesting to its pioneering companies projects, in particular in South America and Asia.

In Trinidad, where there was a slight loophole for the entrance of foreign capital, owing to the fact that in all lands alienated prior to Feb. 17, 1902, the surface owner was also the owner of the oil, it was provided that any grant of oil rights by a landlord was void except with the special approval of the government, which approval would be granted only in the case of British companies undertaking all the obligations of nationality required by the government lease. As a general measure, the sale by British subjects to a foreigner of any oil shares was prohibited. Under this Order in Council, the British Admiralty prohibited the sale of the Mexican Eagle to American capitalists.

The British Admiralty has already secured a controlling interest in the Anglo-Persian Oil Co., which held a concession covering the southern half of Persia. The D'Arcy Exploration Co., a subsidiary of the Anglo-Persian, now has a concession covering 10,000 square miles in Canada and one of 30,000 square miles in British North Borneo.

Of even greater significance is the relation between the British government and the Royal Dutch Shell, which is today easily the most powerful oil company in the world. Theoretically this is under Dutch control, and there have been many allegations and denials in respect to the relation between the British government and this group. In considering the denials one must bear in mind the little-known fact that the management of this company is vested not in the shareholders but in a dozen management shares. Whoever owns a majority of these management shares controls the company, whatever the ownership of the share capital.

Knowing how thoroughly the British government, the British Admiralty, and the special division of the Petroleum Executive, under Sir John Cadman, is committed to the policy of British control of the oil resources of the world, the following facts are explicable only on the basis that the majority of the

management shares of the Royal Dutch are owned either directly or indirectly by the British government:

1. The British government, with the entire concurrence of the Admiralty and Sir John Cadman, granted permission for the sale of the Mexican Eagle to the Royal Dutch.

2. The British government has made recommendations to the Canadian government for the granting of a large concession to the Royal Dutch in the Peace River district, Canada.

3. It is announced that the important oil area of Mesopotamia "will be shared between the Royal Dutch Shell, Burma, and Anglo-Persian groups."

It is of interest to America to define clearly, and maintain what, in the opinion of its government, constitutes a "mandate." It would seem that the British and European conception of a mandate is nothing short of annexation, for with regard to Mesopotamia the British papers speak of this as theirs "by right of conquest."

It is the adopted policy of the British government that no foreigners, or any but thoroughly accepted British companies or companies under the control of the British government, should obtain any rights in any part of the British Empire. It is also the policy of the British government to further, by every means within its power, the bringing of prospective oil territory in other countries under British control.

In order that Americans may combat this British program, it is essential that the American Government recognize, as the British government has done:

1. That foreign petroleum development rests on a very different basis from the foreign marketing of petroleum or any other commodity.

2. That for the good of all concerned, including the country in which the development takes place, large areas are necessary.

3. That in such development honest enterprises require the protection and continued support of their own State Department.

Explorations for Oil in Sumner County, Tenn.

Government Geologist's Advice to Drillers—Better Locations for Wells Suggested—Limits of Depth for Prospecting—Drilling Done at Unpromising Places.

THE success of oil operators in Allen County, Ky. has naturally led to considerable exploration for oil in the adjoining counties of Tennessee. At least thirty wells have been drilled in the northeast quarter of Sumner County, but no producing well has yet been completed.

The part of Sumner County that lies north of the Highland Rim, or "The Ridge," as it is locally called, is recognized as prospective oil territory, for it is underlain by the geologic formations from which oil in Allen County is obtained. To ascertain why no oil has been found in this part of Sumner County the State Geological Survey co-operated with the U. S. Geological Survey in sending a geologist to investigate the area, Kirtley F. Mather, of the last-named Survey, who has just completed several weeks' field work in the northern part of Sumner County.

Mr. Mather reports that the geologic conditions in the Highland Rim section are practically the same as those in the oil-producing territory immediately across the state line, in Kentucky. In this area there are at least four anticlinal folds that are well suited for the concentration and storage of oil. Well records and cuttings from wells now being drilled indicate that in at least a part of this area the formations beneath the "black shale" are well adapted to serve as oil reservoirs. Five drilling machines are now at work in this area, and further explorations will soon be made.

Of the four anticlinal folds that Mr. Mather has mapped, only one has been tested by the drill—one that may be called the Westmoreland dome, as it extends from the western outskirts of the town of Westmoreland in a general northwesterly direction for about a mile. Two dry holes were drilled a few years ago on the property of the New Hope Church near the crest of this anticline. A dry hole that was drilled on the Escue farm, two miles northwest of Westmoreland, is on the northwestern flank of the Westmoreland dome. None of the other dry holes in Sumner County north of the Highland Rim escarpment and east of the main line of the Louisville & Nashville R. R. were drilled at places where the structure is in the slightest degree favorable to the accumulation of oil, nor are any of the machines now drilling in places where the structure is favorable. The failure of these wells to find oil in paying quantities should therefore not be a sufficient reason for regarding Sumner County as unfavorable oil territory.

It is suggested that future exploration should be made on or near the crests of three untested anticlinal folds that Mr. Mather has mapped, which may be called the Dutch Creek anticline, the Big Trammel Creek dome, and the Garrett's Creek anticline.

The Dutch Creek anticline trends in general from northeast to southwest and is crossed by Dutch Creek, 1¼ miles downstream from the Westmoreland-Portland pike. This fold has a large feeding ground, and the results obtained by drilling in that general vicinity indicate that the rocks beneath the "black shale" are probably suitable to serve as an oil reservoir. This fold should be tested by at least two holes. A good location for one of these is a point 1¼ miles south and 1¼ miles west from Turner's station. A second test should be made at a point about 2,500 feet southwest of the first.

A smaller but more pronounced dome lies in the drainage basin of Big Trammel Creek, northeast of Westmoreland. Its summit is one mile north and two miles east from that town. Test wells should be sunk near that point and at places not far north and west of it. Good locations will be found between 1¼ and 1½ miles south-southwest of Pleasant Grove Church.

The Garretts Creek anticline is another northeast-southwest fold, which lies almost in a line with the Dutch Creek anticline. It has a closure toward the

southeast of nearly twenty feet and a large drainage area toward the northwest. The wells recently abandoned or now being drilled in the region northeast of Sugar Grove are far down the northwestern flank of this fold, and the reported showing of oil in Carter well No. 1 suggests the presence of oil nearer the summit of the fold. Good locations for test wells are close to Garretts Creek Church or on the Marsh property, a short distance to the northwest.

There seems to be little use of drilling to depths greater than 125 or 150 ft. below the base of the "black shale" in this part of the county, for the formations below those depths are probably not oil reservoirs. The formation known to geologists as the "Corniferous" limestone, which carries the top pay sand in the vicinity of Scottsville, Ky., is not found in this region, but at least two pay sands may be looked for in the Louisville limestone, which underlies the "Corniferous" in the Scottsville fields, but lies immediately beneath the "black shale" in Sumner County. Both these pay sands should be penetrated by the drill within 125 ft. below the bottom of the "black shale," and if either of them gives a showing of oil the well should be shot before it is abandoned.

The Economic Position of Great Britain With Respect to Petroleum Products

The United States, under war conditions, became the principal exporter of mineral oils to Great Britain, according to a bulletin recently issued by the Department of Commerce, entitled "The Economic Position of the United Kingdom: 1912-1918."

Before the war the United States led in the exportation of kerosene, lubricating oil, and gas oil, and in 1917 the United States was still the principal exporter in each commodity, with no other country even a close second. In that same year, Great Britain received 85.9 per cent of the fuel oil that she imported from the United States. The most striking development in the mineral-oil trade of the United Kingdom was the sharp increase in the receipts of fuel oil in the last two years. In 1918, imports of fuel oil by Great Britain were more than 1,700 per cent of the 1912 total and 900 per cent of the 1913 figure. The need for fuel oil in industry and as ship fuel under war conditions, it is pointed out, was responsible for this development.

Another striking feature of the mineral-oil trade of Great Britain is the insignificant imports of crude petroleum. In 1913, importations of crude petroleum amounted to something more than a million gallons, and in 1914 approximately 15,000,000 gallons was received. Since that date, however, importations of crude petroleum have been slight, indicating a small oil-refining industry in the United Kingdom.

"The only mineral oil produced in the United Kingdom," the report reads, "is secured by the reduction of the oil shale mined from the shale beds of Scotland. About 3,000,000 tons of shale is produced each year, furnishing from 70,000,000 to 80,000,000 gal. of oil. This means that the United Kingdom is dependent upon the outside for 85 per cent of her normal petroleum requirements. Recently there has been a good deal of discussion as to the possibilities of developing a petroleum industry in England. Lord Cowdray has offered a large sum for experimental purposes, and has secured the services of American oil experts in locating oil deposits and in doing the preliminary drilling. Thus far this matter is entirely in an experimental stage, and it is impossible to predict what effect it may have upon the British oil trade."

Texas Oil Production

According to information sent out by Henry L. Doherty & Co., New York, large quantities of light oil that has been discovered in North and Central Texas promises to put that state in a position to compete with California in importance as an oil producer. Predictions have been made placing Texas production for 1919 at more than 90,000,000 bbl. This is not based on mere prospects, for Texas had produced so far this year more oil than in the entire year 1918. Texas production is estimated at 34,000,000 bbl. in the first six months.

The Burkburnett district, Ranger and Breckenridge, as well as Desdemona, the principal light-oil fields of Texas, are bringing in new wells at from 1,000 to 5,000 bbl. daily output, and there is no doubt that Texas production for the latter part of this year will exceed that of the first six months. The following table shows production in the principal fields of Texas for the first six months of 1919, and the years 1918 and 1917, in barrels:

Field—	First Six Mos., 1919	Yr. 1918	Yr. 1917
Ranger	9,621,115	3,784,434	29,055
Wichita County (Burkburnett)	8,640,110	11,527,034	9,541,636
Breckenridge	1,505,470	598,437	36,219
Goose Creek	3,362,680	8,943,635	7,300,279
Damon Mound, West Columbia	2,933,420	283,527	124,325
Humble	1,755,805	6,555,173	7,389,831
Sour Lake	1,302,815	3,407,696	4,763,004

In 1918 the production of Texas was divided into 17,280,612 bbl. of light oil and 21,469,419 bbl. of heavy oil. This year the light-oil output of the state will total more than twice that of heavy oil. Texas has produced a total of 327,500,000 bbl. of oil since oil was first struck in the state in 1889. The state's production by years since that date is shown in the following table:

1918.....38,750,000	1910..... 8,900,000	1902.....18,100,000
1917.....32,410,000	1909..... 9,530,000	1901..... 4,390,000
1916.....27,640,605	1908.....11,200,000	1900..... 840,000
1915.....24,940,000	1907.....12,320,000	1899..... 670,000
1914.....20,100,000	1906.....12,570,000	1898..... 540,000
1913.....15,010,000	1905.....28,100,000	1897..... 66,000
1912.....11,740,000	1904.....22,240,000	1896..... 1,400
1911..... 9,530,000	1903.....17,960,000	1889-1895 360
		Total 327,547,760

Texas did not come into great importance as an oil-producing state until 1901, but from that year to 1905 her output increased from 4,000,000 to 28,000,000 bbl. Following 1905 a decline took place until 1910, when 8,900,000 bbl. was produced. From 1910 to 1918 the state's production increased from 9,000,000 bbl. to 38,000,000 bbl., or more than 300 per cent.

CORRESPONDENCE AND DISCUSSION

Letters From the Mining and Metallurgical Industry Dealing With Pertinent Subjects of Interest

Mexican Issue Must Not Be Sidetracked

Several groups of intellectual Mexicans, we among them, have undertaken the duty to write to all so-called technical papers in the United States, in order to rectify the erroneous ideas, which they are recently publishing, referring to our country. We belong to a social class which has always tried to establish a current of sympathy and good-will between the two nations, and for this reason, first of all, we are sorry that the American technical papers heap outrages upon our country and do their best to destroy all the ties of union which some men, who in both countries pursue high ideals, have tried to establish.

The Engineering and Mining Journal publishes in its issue of Aug. 16, 1919, an article called "The Mexican Issue Must Not Be Sidetracked." Your correspondent, who has informed you that there is "no noticeable improvement in conditions" in Mexico, is misinformed, for it is understood by thousands of Americans who live among us, and whom we meet daily, that our situation, in every sense, even if we still suffer great evils, has greatly improved, compared with the state of affairs prevailing two years ago. We do not want to make this letter too long, and for this reason we cannot go into details of all the points we think are necessary in order to make the intelligent people of your country acquainted with our true situation. Suffice it to say that, with the exception of a few well-known regions, everybody can travel and work in full security, especially all foreigners.

We, the same as you, desire that no more Americans be killed by bullets bought in the United States, and for this reason we wish that you would insist that in the future the rebels in Chihuahua and the oil region of the Gulf receive no more protection from American business men. Besides, we also wish that the American gold, proceeding from Mexican oil, be not used any more to pay newspapers who insult Mexico, publishing even grave errors. We are referring principally to the use made of the now fashionable word "confiscation," employed always to point out legitimate acts of the Mexican nation in order to maintain her sovereignty.

In the actual state of human civilization no nation can live in isolation. There exists a respective dependence, interpreted by economical, social and moral ties, in virtue of which humanity aspires to the supreme ideal of good will and peace, proclaimed by President Wilson, which includes, as an indispensable factor, the respect of weak nations. If a nation, supposing she is very big and powerful, pretends to appoint herself tutor and guardian, and even imposed administrator, with no other right than the one derived from power, this only means the destruction of the basis of this beautiful ideal of human solidarity. And this role of imposed tutor befits still less a country which, like the United States, has still many interior problems to solve and many vices to cure.

The same number of your paper in which the article referred to was published gives us notice of the appointment as Editor of the Engineering and Mining Journal of Mr. J. E. Spurr, prominent geologist, well known in Mexico through his books, his studies in the mining camp of El Oro, and his many articles in different technical papers. Our desires are that Mr. Spurr, upon taking charge of his post on Oct. 1, 1919, will introduce a radical change in your paper, making it a purely scientific and technical one.

L. Perez Castro, C. E., Mem. Am. Soc. C. E.,
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Santa-Ana Almada,
P. O. Box 2049, Mexico City.
J. Vasquez Schiaffino, C. E.
P. O. Box 1204, Mexico City.
S. Suluguis, M. E.
El Oro St., No. 11, Mexico City.

The following is the reply to the above letter:

New York, Oct. 15, 1919.

Sr. L. Perez Castro,
My Dear Senor Castro:

Your recent letter, of yourself and associates, addressed to Mr. Parmelee, has been turned over to me. I am taking the liberty of making extracts from your letter and publishing these under your signature. I hope that you will approve of my rather severe editing, but I wish to eliminate statements that might cause prejudice.

The mining industry, and the Engineering and Mining Journal as its representative, is vitally interested in industrial or political problems which affect it, and I think our policy must be to continue to cover all these problems in the future even more fully than in the past. Rest assured, however, that this journal is not controlled or in the pay of oil interests or any other interests, that I myself have a feeling of friendship toward Mexico and the Mexicans, and it is for this reason that I am publishing extracts from your letter, in order to give our readers your point of view.

I must confess that my own feeling has been that Mexico, since the days of the successful administration of Diaz, has been unable to gather enough strength to restore a peaceful and prosperous administration, and that it can hardly do it without the friendly assistance of other powers. It has never been my thought, however, that any such assistance should be taken with any other view than to assist in establishing a state of good government which the Mexican people might thereafter carry on unaided.

If this point of view is in error, I should like very much to know the facts, and I think you may believe that the American people, as a whole, are very far from wishing to do anything that is not for the advantage of Mexico and the betterment of the world.

Thanking you for your letter and hoping for further correspondence from you and other intelligent Mexican citizens, I am,

Very truly yours,
J. E. Spurr,
Editor.

Geological Survey Reports

Your suggestion that it would be helpful to have a review of the oil possibilities of Nevada appears to me excellent. In fact, such reviews are needed for all the states, outlining the portions of the state where prospecting may be regarded as money wasted and other portions where information is either insufficient to permit definite statements regarding oil possibilities or where it is believed there is at least a chance for the production of oil and gas.

There is a particular dearth of information on the oil and gas possibilities of Nevada, and, even though all the available data were assembled, there are large portions of the state which are terra incognita so far as their oil and gas prospects are concerned. It is known that much of the state is mountainous and that in these mountainous regions the formations either are not of a character to contain petroleum or else deformation has been so severe that any oil which may once have existed in the strata must be reduced to residuum, so there can be no chance of commercial production from them. In other parts of the state it is known that there are Tertiary formations which might possibly be petroliferous. However, these formations are of fresh-water origin, and it has not been established that petroleum can be derived from fresh-water organisms, although it is the belief of many of the geologists of the Survey that this is entirely possible or even probable.

It may be possible some time later in the year to assign a geologist to the task of constructing "safety maps" for some of our Western states, outlining the areas which are believed to be unfavorable for prospecting, those concerning which the prospects are indeterminate, and those where conditions are most favorable. At present, however, the work in hand exceeds the capacity of the available force.

In planning a series of reports on the geology and ore deposits of individual states, New Mexico was chosen as the subject of the initial volume of the series, because the general geology of the state is more simple than that of many parts of the West and the mining districts are less numerous than in most of the other Western states. Consequently, no special effort at condensation was required to keep the report down to a reasonable size.

The report on Utah, by B. S. Butler and others, now in press, is much larger than that on New Mexico, and this difference suggests that it may be necessary, if reports on other states are not to become too unwieldy, that some more definite policy must be followed in planning these reports. Are they, for example, to be essentially encyclopedias within which is to be found in condensed form practically all that is known of the geology and ore deposits of a state, or are they to be readable outlines rather than comprehensive reference books? The report on Utah is partly a compilation of published material on the more productive districts, with considerable original description of less known or less developed districts and with discussion of the general relations of the ore deposits to geologic structure and history.

It appears to me that the ideal to be aimed at in these reports is the elimination, so far as is practicable, of detailed description, this being published elsewhere in special reports devoted to particular districts or problems. The state report should contain a clear and comprehensive account of the geology of the state and should show how the ore deposits are related to geologic structure and history. It should contain, also, a history of mining within the state—condensed, generalized accounts of the principal mining districts, with complete references to other publications that treat these in greater detail. If a district has not previously been studied in detail, it is likely to be difficult to decide how comprehensively it shall be treated in a report on the state as a whole. The geologist is tempted to present his facts and conclusions in full, but I am inclined to think that the main purpose of such a report as I have in mind will be better fulfilled if he exercises considerable restraint and emphasizes his general conclusions rather than the facts upon which they are based. At times, especially if a district is of particular interest and there seems to be no likelihood of giving it adequate description in the near future in a separate publication, it may be advisable to compromise between thorough detailed treatment and a generalized outline.

The report on the Geology and Ore Deposits of Utah to be published as Professional Paper 111, should be ready for distribution in about three months. By comparing it with the report on New Mexico (Professional Paper 68), geologists and mining engineers will be able to appreciate some of the questions to be answered with respect to reports planned for other states. Expressions of opinion in your columns, from men of these professions, as to how these reports can be made most useful to them, will be heartily welcomed.

George Otis Smith,
Director U. S. Geological Survey.
Washington, D. C., Sept. 22, 1919.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Centralization of Government Statistics Suggested

Great saving of public money and increased efficiency will result, in the opinion of Representative Good, chairman of the Committee on Appropriations of the House of Representatives, if all statistical activities of the Government are concentrated in a single bureau. He believes that the Bureau of the Census would be the best agency in which to assemble all the statistical work. He also is of the opinion that the industries of the country are entitled to more prompt statistical returns, which, in most cases, he is convinced, should be made every ten days.

Basing Point for Steel

Useless agitation, with no prospect whatever of benefiting the great body of consumers, according to disinterested specialists, is certain to result from the proposal to have the Federal Trade Commission pass on the matter of abolishing the system of basing prices of raw steel on Pittsburgh. Though it is admitted that a few communities might benefit, it nevertheless must be recognized, it is said, that the raw materials used in the making of steel can be assembled more cheaply at Pittsburgh than at any other point. In addition to the necessity of making over the whole economic structure on which the steel industry operates, there would be long litigation, which Judge Gary predicts would be the greatest lawsuit in the history of the country. The Federal Trade Commission has given out a statement in connection with the matter.

Economy Liaison Committee

Official status for the Economy Liaison Committee of the State Department is suggested by Van H. Manning, Director of the Bureau of Mines, in a letter to the President of the Senate. He points out that that committee, despite its informal status, has done a great deal to promote foreign commerce in mineral and other commodities by acquainting the representatives of the various departments with the current situation with respect to foreign trade. The Liaison Committee, made up of representatives from interested bureaus, has been operating under the direction of Wesley Frost, Chief of the Economic Intelligence Section of the State Department. The Bureau of Mines and the Geological Survey have taken active part in the work pertaining to foreign trade in minerals. The committee already has issued reports on the situation pertaining to coal, petroleum, potash, cotton, finance, and credits.

Phosphate Not Under Government Control

Reports that phosphate rock and bulk acid phosphate were to be subjected to Government control have been denied at the Department of Agriculture. Following a conference on Oct. 6, the Secretary of Agriculture decided that no effort would be made to name fair profits for any fertilizer ingredients. He will, however, stand ready to exercise his powers under the licensing system against profiteering in acid phosphate or any other fertilizer ingredients.

The matter of undertaking a special investigation of the recovery of petroleum from oil shale is receiving the active attention of the Mines and Mining Committee of the Senate. Senator Henderson has asked that $140,000 be authorized for that purpose, but some members of the committee are of the opinion that the work should be started with a lesser amount.

New Process for Roasting Lead-Zinc Sulphides

M. F. Coolbaugh has patented a process for the roasting and sulphatizing, followed by the leaching and smelting, of sulphide ores and concentrates containing lead, zinc, copper, and iron (U. S. Patent No. 1,315,761, Sept. 9, 1919). The ore is first roasted in the ordinary type of mechanically rabbled furnace for the purpose of changing the sulphides to oxides. The calcined material is then transferred to a second similar furnace, through which passes the gaseous products from the first treatment. The temperature and time of treatment are so regulated that in the second furnace the oxides of zinc, copper, and lead and the silver chloride are changed into sulphates. The resulting product is treated with water, the sulphates of zinc, copper, and silver being dissolved and the metals later electrolytically recovered. The insoluble residue containing the lead sulphate, iron oxide, and metallic gold and silver is smelted.

Lead and zinc in many cases cannot be efficiently separated by mechanical means. Under present processes any lead going to the zinc retorts makes the recovery of the zinc more difficult, and vice versa. Commercially, the ore of either metal is penalized for containing appreciable amounts of the other. These difficulties, it is claimed, are overcome by the process described.

Trade with Jugoslavia.—The import and export of all mine products and the importation of machinery and appliances for mining purposes have been declared free of duty by the Ministerial Council of Jugoslavia, according to a report recently received by the Bureau of Foreign and Domestic Commerce.

By The Way

Hoover and the Geological Survey

A large photograph of Herbert Hoover, appropriately framed, has been hung in the conference room of the U. S. Geological Survey. This was done because Mr. Hoover formerly was an employee of the Survey. In 1895 he served with that organization as a field assistant with a geological party in Nevada.

Gold

The dross of droning commerce! No more than gilded lead!
The tinsel-foil that sweating toil must count the worth of bread!
No longer virgin metal—stained with minted brands—
That each in turn, to save or earn, must wrest from other hands!
To seek you—there the splendid game! From fissures thinly run
In deepest mine—such treasure fine is ever cleanly won!
A smiling nature yields you—her gracious gift to men
Who dare to choose—who risk and lose—yet seek and find again!

W. H. Gardner.

Poisonous Plants

At the cyanide plant of the Empire mine in Grass Valley, Cal., particular care has been taken to post conspicuous signs calling attention to the poisonous nature of the solutions and the cyanide salt used. In the West, botanists have for a long time been investigating "poisonous plants" but no mention has been made of the "cyanide plant," which flourishes in some silver mining districts and more often than not can be found in gold mining camps. Their attention is called to the excellent specimen at the Empire mine.

Twenty-five Cents Par Value

A Chicago dispatch states: "A new alloy that can be substituted for platinum or gold where acid-resisting metals are required has been discovered by Prof. W. S. Par, of the department of chemistry of the University of Illinois. The alloy, which Prof. Par has named "illium" in honor of the University, costs approximately 25c. an ounce, whereas platinum costs $140 and gold $40."—Illium may possibly find a market in our Troy laundry where we believe that acid-resisting metals must be needed. At any rate, gold at $40 will interest the members of the National Gold Conference which recently met in St. Louis.

What's in a Name?

With an airy wave of the fairy wand that turns deficits into profits, Divide, Nev., becomes "Sigold" at the command of the Post Office Department. The new name is apt if not euphonious, for it is derived from "silver" and "gold" which metals brought the camp its fame. Would that this same felicitous touch might tame the wildcats! But it is to be regretted that the change is made so late. Under the name of Divide the camp has acquired a reputation that for both practical and sentimental reasons the Post Office Department might well have retained. There is magic in the word "Divide," as brokers all will testify.

From Sourdough to Earldom

One of the recent boats out of Dawson, Y. T., carried Robert Leeson, who has followed mining and prospecting in the North for twenty-one years. Leeson was on his way to Ireland to claim the title and estate of the Earl of Milltown, it is said. His elder brother is believed to have lost his life in a shipwreck, having been missing for ten years. Leeson has never known the thrill of a big strike, though he has spent the better part of his life in the quest for gold. He knew the town of Dawson when it was the Mecca of the world's greatest gold stampede, and was there recognized as the champion chess player of the Yukon. He left Dawson in the garb of the frontier, and was given a rousing send off, as, carrying his own baggage, he boarded the boat for the "outside." Leeson said that if he secured the estate he will satisfy his ambition to cruise round the world—and then return to the Klondike.

An Old Report

In the days before the great uplift in technical writing, the report of even a competent engineer was sometimes a crude affair. In such a report written in 1876 we read the following:

Your lowest level and adit have reached the deposit, and I saw the galena in the heading, 220 ft. from the surface. I believe the lode to be a regular true-fissure deposit and therefore, with the consentient opinion of all authorities, likely to continue in depth.

The underground works you have already accomplished which have enabled me to inspect the conditions and form the foregoing opinion, are as follows: A vertical shaft in the vein, with five levels and certain cross cuttings. The shaft being now 230 ft. deep, and the levels on the chimney averaging 100 ft. in length, it is evident that the laying open of the mine is adequate to afford an intimate examination and pretty general conclusions.

You have now connected your first level with shaft No. 2, 150 ft. west of your actual service shaft. We may say that the ore in sight on your first level is 1,500 cu. yd.; on the second, 2,500 cu. yd.; on the third, 5,000; on the fourth, 7,500; and on the fifth, 10,000; in all—say 40,000 gross tons, which, according to your own experience at your mill will concentrate into not less than 4,000 tons of dressed ore, the average sale value of which has hitherto been $94 per ton.

As for the underground works themselves, their disposition and execution deserve nothing but praise. Your shaft No. 1, which has been sunk in the best manner by Burleigh drills moved by compressed air, is solid and well timbered, 12 ft. by 4, divided into three compartments, in one of which is your Cornish pump, established in perfect condition; in the other two, your hoisting, which, although it will later be modified, has now one excellent guided cage and one bucket in service. Ultimately the hoisting apparatus, amplified only by replacing the bucket by a cage, will serve in that shaft for any extraction you will probably desire to attain.

Your levels, when somewhat enlarged for the accommodation of cars, will satisfy also the most complete and rapid stoping, so that, so far as preparation is concerned, you have little farther to expend in order to break down, transport and hoist 100 tons per day.

PERSONALS

M. Leopold is installing the Bureau of Mines exhibit.

Colby Dodge, of Los Angeles, was in Lovelock, Nev., on professional business on Oct. 20.

H. A. Megraw, metallurgical engineer for Kennedy-Van Saun Mfg. & Eng. Corp., was recently in San Francisco.

Rene de Sallier du Pin has accepted a position with the Societe Franco-Americaine de Metaux, at Paris, France.

E. J. Schrader, of Herbert Humphrey's engineering staff, was examining mines in Pershing County, Nev., during October.

Ralph T. Hirsh arrived in Havana, Cuba, early in October. Mr. Hirsh intended to leave on a professional trip into the interior.

William Sharp, engineer for George Wingfield, made a general examination of the Loring district in Nevada during the latter part of October.

W. T. Lundy, of San Francisco, Cal., and **C. S. Boalich,** of the State Bureau of Mines, are in the southern part of Nevada on mine-examination work.

Stanley Mahon has returned to Virginia, Minn., having completed the installation of a mill to treat pyrites at a Georgia property of the Hanna interests.

John Butler, of Butler Bros., is inspecting the various ore-drying plants of the Lake Superior district with a view to installing one at the Margaret mine.

Marion L. Thomas expected to return to New York during the last month after investigating mining properties in Nevada and other states for several months.

C. N. Schuette is leaving San Francisco, Cal., to accept the position of superintendent of the Mariscal Mining Co.'s quicksilver mine, at McKinney Springs, Tex.

Frank Billings and **Carmi Thompson,** president and vice-president respectively of the Tod-Stambaugh Co., have completed a tour of inspection of the company's Minnesota holdings.

P. S. Smith, the administrative geologist of the Geological Survey, is installing the Survey's exhibit, which will be shown at the convention of the American Mining Congress at St. Louis.

C. W. Newton, of Wallace, Idaho, manager of the Consolidated Interstate-Callahan Mining Co., has gone to Rochester, Minn., where he will submit to an operation at the Mayo hospital.

Emmett Flynn, safety inspector for the northern mines of the Republic Iron & Steel Co., represented that company at the safety conference recently held at Pittsburgh by the U. S. Bureau of Mines.

Harris & Ewing

R. B. MOORE

R. B. Moore, superintendent of the Golden station of the U. S. Bureau of Mines, has been appointed chief chemist of the bureau, succeeding Charles L. Parsons. Dr. Moore will leave for Washington about the middle of November. **S. C. Lind,** assistant superintendent, has been appointed to Dr. Moore's place, and **Will C. Coghill,** of the Seattle station, will succeed Dr. Lind.

Major W. H. Ferguson, who was with the 317th Engineers in France, was in the Loring district in Nevada during the latter part of October, to examine the Treasure Hill property for New York clients.

SOCIETIES

The National Safety Council in accordance with the action of the annual meeting on Oct. 1 through its Executive Committee has approved the organization of an engineering section for the purpose of bringing together the mining, civil, mechanical, electrical, and chemical engineers among the membership. The membership qualifications are similar to those of the national engineering societies. Among the functions of the section will be the following: To furnish technical information as desired; to perform technical services for the council such as the development of standards and by inquiry or research to solve special engineering problems arising in safety work.

American Institute of Mining and Metallurgical Engineers, Colorado Section, held a meeting at the Denver Club, Denver, on Oct. 15, in honor of Horace V. Winchell, president of the Institute. The gathering was informal.

American Institute of Mining and Metallurgical Engineers, Montana Section, will hold the Fall meeting on Nov. 8 at the Montana Notel, Anaconda, Mont. The following papers will be read: "The Reverberatory Furnace for Treating Converter Slag at Anaconda," by Frederick Laist and H. J. Maguire; "The Dust Problem and Cottrell Treater Installation at the Washoe Smeltery" by James K. Murphy.

The Mining and Metallurgical Society of America will hold a reception and dinner in honor of Eugene Schneider, head of Schneider & Co., operating the Creusot and other steel works of France; honorary member, American Iron and Steel Institute; president, Iron and Steel Institute of London; president, Comite des Forges de France, on Nov. 24, 1919, at the Hotel Biltmore, New York. The gold medal of the society will be presented to him on this occasion.

OBITUARY

Herbert G. Thompson, for several years superintendent of the Nevada Packard mine, in the Rochester district, Nevada, was killed on Sept. 25 as the result of a fall from the 300-ft. level. Mr. Thompson was thirty-one years old and is survived by his wife, child, and mother. The funeral was held in Oakland.

INDUSTRIAL NEWS

W. D. Ward has been transferred from the San Francisco office of the Pelton Water Wheel Co. to their New York office, where he will have the title of manager of the Atlantic department, which includes the territory east of the Mississippi, Europe and South America. Mr. Ward has been with the Pelton company for twenty-five years and until recently held the position of contract and sales engineer. In New York he succeeds F. W. Gay.

Collins & Webb, of Los Angeles, Cal., have opened offices at 229 Rialto Building, San Francisco, with G. A. Fisher in charge.

Walter Hasendahl, formerly in charge of Allis-Chalmers Mfg. Co. district office in Los Angeles, has entered the firm of Rosenburg & Co. as consulting engineer. Rosenburg & Co. have offices and warehouses in Los Angeles and Congress Junction, Ariz., and handle both new and used mining, crushing, power and pumping machinery.

Smith, Booth, Usher Co. announce the removal of their San Francisco offices and warehouse to 140-42 Fremont Street.

The Pacific Tank and Pipe Co., a California corporation, has issued $750,000 of first mortgage, 7% sinking fund gold bonds of date Sept. 1, 1919, and due Sept. 1, 1929.

The Merchants' Association recently issued its year book, which covers the year ended April 30, 1919. The book contains a list of members and the reports of the president, the secretary, the chairman of the member's council, and the heads of the various bureaus.

The Dickey Steel Co., Inc., Woolworth Building, New York, has been appointed eastern sales and export representative of the Hammond Steel Co., Inc., of Syracuse, N. Y., manufacturers of high-speed, alloy, and straight-carbon tool steels. The alloy steels are manufactured in bars, weldless rings, die blocks, and special shapes.

Parsons-Moorhead Machinery Co., Hostetter Building, 237 Fourth Ave., Pittsburgh, has been organized to do a general machinery business. William L. Moorhead, of this company, was formerly vice-president of the Duquesne Electric & Manufacturing Co., and Mr. Parsons has been engaged in a general machinery business for several years.

Black and Decker Manufacturing Co., Baltimore, Md., is erecting a new plant at Towson Heights, Md. The new building will be 100 x 200 ft., erected on the west side of the present plant and planned to conform architecturally to the residences being erected on Joppa Road. The general offices have been removed from Baltimore to Towson Heights.

The Lidgerwood Manufacturing Co., of New York, announces the opening of a branch office in the Hammond Building, Detroit, Mich., for the sale of the company's contractors' hoists, derricks, and cableways, mine hoists, ships winches and steering gear, and logging machinery. R. S. Hutchinson, formerly of the Lidgerwood office in Philadelphia, will have charge of the Detroit office, under the direction of F. B. Knight, of the Chicago office, who previously handled this business in Detroit.

The Electric Furnace Co., Alliance, Ohio, has announced the installation of nine new Bailey electric furnaces for melting non-ferrous metals and alloys as follows: The Drew Electric and Manufacturing Co., Cleveland, Ohio; the Nolte Brass Co., Springfield, Ohio; Kennedy Valve Co., Elmira, N. Y.; American Bronze Corporation, New York City; Dominion Steel Products Co., of Brantford, Ontario; the Deming Co., Salem, Ohio; Miller Pasteurizing Co., Canton, Ohio, and Landers, Frary & Clark, New Britain, Conn.

H. A. Wilson Co., Newark, N. J., have recently placed on the market a new product known as "Wollaston" wire. It has a platinum core and a silver exterior. It is drawn to about .004 in. diameter of silver, and the platinum core is reduced to the extremely small size of .00006 in. diameter The silver outside may be dissolved off in acid, leaving the platinum core intact. This wire is manufactured in long lengths with a continuous platinum core. Wire of this description was made in Germany before the war and exported to other countries.

Western Wood Pipe Publicity Bureau has been formed by the four largest manufacturers of wood pipe upon the Pacific slope, for the purpose of disseminating information about Western wood pipe. The bureau will make an especial effort to have wood pipe properly installed and to promote its use for purposes for which it has proved suitable. The four companies are: Continental Pipe Manufacturing Co., of Seattle; the American Wood Pipe Co., of Tacoma; and the Redwood Manufacturers Co. and the Pacific Tank and Pipe Co., both of San Francisco. Offices of the bureau have been established in the White Building, Seattle, with E. J. Bartells, manager.

TRADE CATALOGS

Magnetic Manufacturing Co., Milwaukee, Wis., has sent out a circular describing the Type L separator, which, it is claimed, possesses a large capacity for handling material efficiently. A high-duty magnetic pulley is also described, as well as Type F separator for steel and iron.

Steam Shovels, Cranes, and Dredges. The Osgood Co., Marion, Ohio; 8¾ x 11; 31 pp.; illustrated. Describes revolving and railroad types of shovels for various kinds of work. The catalog is written in Spanish, with an English translation on the opposite page.

The Terry Turbine. Terry Steam Turbine Co., Hartford, Conn.; 8½ x 11; 30 pp.; illus. Describes the company's non-condensing turbine, possessing particular features, which it is claimed results in increased efficiency and economy in space. A condensing type which is built in sizes from 1 to 1,500 hp. is also described.

Champion Kerosene-Burner Co., Kenton, Ohio, has sent out information describing a new portable furnace claimed to generate a temperature of 3000 degrees within five minutes. This heating unit, which is self-contained, has been designed for heating rivets, heat-treating tools, "shrinking-on" processes, and similar operations requiring an intense heat in a small portable furnace.

Milliken Buildings. Milliken Brothers Manufacturing Co., Woolworth Building, New York. Catalogs Nos. 10 and 11; 8½ x 10¾; 44 and 32 pp. respectively; illustrated. Contain complete foundation plans, erection diagrams, construction details, and directions for the erection of buildings. It is stated in the introduction that this is a supplement to Catalog No. 10 and is designed to be a complete guide for the erection of Milliken buildings, including, as it does, in simple and ready reference form, the essential information needed for the erection of the building from foundation to completed structure. This has been made possible by the use of the standardized truss-unit system.

NEW PATENTS

U. S. patent specifications may be obtained from the Patent Office, Washington, D. C., at 5c. each.

Tools—Pneumatic-Tool Handle. Morton C. Hutchinson, assignor to Chicago Pneumatic Tool Co. (1,315,554; Sept. 9, 1919.)

Tungsten—Compressed Tungsten Powder. Carl A. Pfanstiehl. (1,315,859; Sept. 9, 1919.)

Welding—Method and Compound for Welding Steel and Other Metals. Hughes L. Siever, Erie, Pa. (1,315,611; Sept. 9, 1919.)

Zinc-Retort Residues, Treatment of. Oscar Spitzer, New York, N. Y., and Cairy Clyde Conover, Springfield, Ill. (1,315,349; Sept. 9, 1919.)

Zirconium—Basic Sulphate of Zirconium and Method of Making the Same. Edward J. Pugh, assignor to Pennsylvania Salt Manufacturing Co. (1,316,107; Sept. 16, 1919.)

THE MINING NEWS

New York, November 1, 1919

Disaster in Cornish Tin Mine

Rod of Man Engine Breaks as Shifts Are Changing—Many Lives Lost

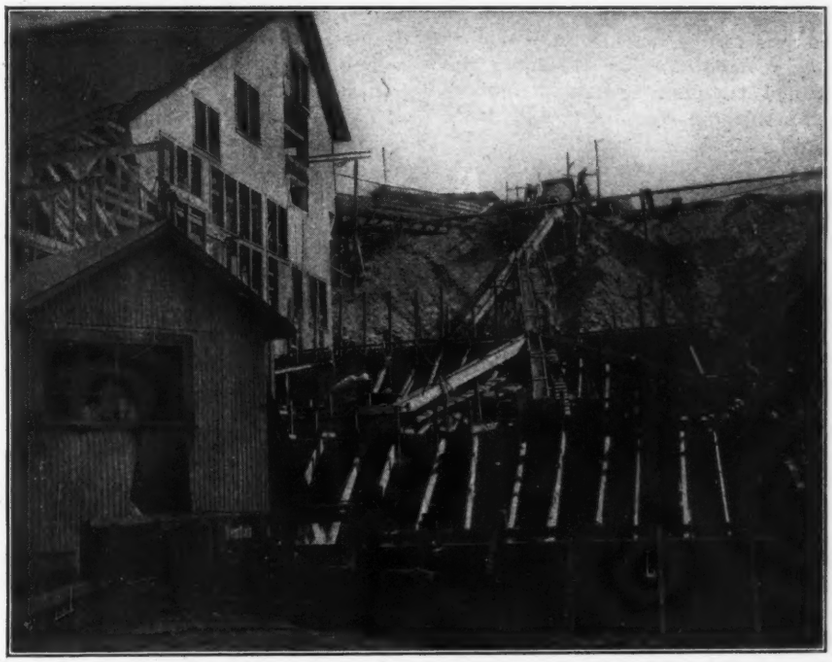
A large number of men were killed on Oct. 20 when the man engine of the Levant mine, at St. Just, Penzance, Cornwall, broke down as the crew was being raised to the surface. The Levant man engine is said to be the only survivor of the type in the world. The rod broke at the nose at the moment when the engine was at the top of its stroke, thus permitting the giant lift ladder, a ponderous beam 300 "fathoms" long, on which were over 100 men, to drop the length of the stroke, a distance of 12 ft. Consequently some of the men were knocked off and squeezed against the sides of the shaft, and some of the ladder sollars were smashed, as well as the platform on which the men stood. The passage up the shaft was thus blocked in places.

Surfacemen were at once organized into rescue parties and sent to various levels leading into the man-engine shaft to get out any injured, other shafts being used for the purpose. The rescuers were within speaking distance of the men in the 12 and 24 levels, but the platforms had been knocked out, and it was impossible for them to go up or down. A road, however, was put in for these men and they were freed. Most of the men who were on the man engine are stated to have again returned to the levels to help in the rescue work.

It was stated by the manager that the engine was inspected and oiled every day. At the place where the breakage occurred a new beam was put in a short time ago, and the iron rod and two iron caps were practically new. This method of raising and lowering men has been in use at Levant about seventy years.

Improvements at Empire Mine at Grass Valley, Cal.

An addition is being made to the Empire Mines & Investment Co.'s stamp mill at Grass Valley, Cal. The number of stamps will be increased from 60 to 80. The cyanide plant is being enlarged to a corresponding extent. Between the mill and the Pennsylvania shaft a narrow-gage trolley line is under construction and has been practically finished. All of the ore produced from the Pennsylvania shaft will be transported over this line to the mill at the Empire shaft. The effect of this will be to concentrate all milling in one plant instead of at two plants, as at present. The addition to the mill, which is shown in the accompanying cut, it of substantial construction, retaining walls and mortar block being of concrete. A new tailings dam is also being constructed. It is expected that this dam will provide ample storage for tailings for a long time.



CONSTRUCTION OF 20-STAMP ADDITION TO CYANIDE MILL OF EMPIRE MINES & INVESTMENT CO., GRASS VALLEY DISTRICT, CALIFORNIA

Iron-Ore Shipments Curtailed by Steel Strike

It is estimated that Lake Superior iron-ore shipments will be in the neighborhood of 47,000,000 tons in 1919, or 13,000,000 tons short of last year. A tonnage of 50,000,000 would probably have been attained if the steel strike had not occurred, as the Lake movement has slowed up considerably since the strike was declared. The September shipments totaled 8,178,483 tons, a decrease of 816,531 tons from the figures for the same month of 1918. The total movement to Oct. 1 was 37,776,531 tons. It is because of the hopeful outlook for next season that the operators are stocking at the mines, although many of them have considerable ore to carry over. One mine on the Marquette Range has over 300,000 tons of crushed hard ore awaiting a market. The lump ore from this property finds a ready buyer, but the crushed is not in demand, owing to changes in furnace practice in recent years. Another Marquette Range property which produces high-grade Bessemer hematites must carry most of the 1919 output over for another year at least. This mine never had difficulty in finding furnaces to take its ores, but the open-hearth furnace has brought about the change.

Employment Office Re-established at Wallace, Idaho

I. W. W. to be Barred From Mines—George T. Edmiston Will Again Take Charge

The employment office has been reestablished at Wallace, Idaho, in the Coeur d'Alene district. The office opened on Oct. 21 in charge of George T. Edmiston. The plan, in fact, was never wholly abandoned, for after all other companies had discontinued it, the Bunker Hill & Sullivan company stuck to it, which to a large extent explains why that company alone was not involved in the recent strike. Following the trouble twenty years ago, when the miners' union blew up the Bunker Hill & Sullivan mill, a permit system was

devised by the military authorities through which all mines were supplied with men, the purpose being to prevent the employment of all those members of the Western Federation of Miners who were in sympathy with the lawless element. With the withdrawal of the military, the permit office was succeeded by the employment office. This was a voluntary arrangement among the operators to prevent the lawless element from gaining control. An office was established at Kellogg and at Wallace, and all companies employed their men through one of the offices except the Hercules, which was controlled by the Days.

The Wallace office was discontinued about three years ago, but the Bunker Hill company continued the Kellogg office. The chief purpose of the office at this time is to guard against the employment of members of the I. W. W. The mines to be served by the Wallace office are the Morning (Federal) and Hunter, at Mullan; Hecla and Hercules, at Burke, and Tamarack and Interstate-Callahan, at Nine Mile.

Sampling Charges on Nevada Ores Announced

Announcement has been made for the benefit of Nevada ore producers by F. C. Lincoln, State Ore Sampler of Nevada, that at Hazen, Nev., there is a minimum charge of $5 on small lots of ore and 25c. per ton is charged on lots in excess of twenty tons. At the Selby smeltery and at the Nichols plant of the General Chemical Co., in California, there is a minimum rate of $7.50 on small lots and a charge of 25c. per ton on lots in excess of thirty tons. At the Mammoth smeltery in California and the Garfield and Murray smelteries in Utah, the minimum rate is $6.25 on lots of less than twenty-five tons. Minimum rates at other points will be fixed as rapidly as possible, but, at present, rates at purchasing points not mentioned are actual costs of supervision for lots of less than fifty tons, and 25c. per ton on lots of fifty tons or more. Special low rates may be made upon large lots to suit local conditions.

Mr. Lincoln recently made the following announcement of appointments at smelteries and ore buying establishments outside of Nevada: Abbot A. Hanks, of San Francisco, is deputy for the Selby smeltery and Nichols plant of the General Chemical Co. Charles Kunze, of Kennett, Cal., is deputy for the Mammoth smeltery. W. E. West, of Salt Lake City, is deputy for the American Smelting & Refining Co.'s Murray and Garfield plants, for the U. S. Smelting & Refining Co.'s Midvale smeltery and for the Utah Ore Sampling Works. George Howarth is deputy for the International Smelting Co.'s Tooele plant.

New Capital Enters Eureka District, Nevada

The Mining & Development Corporation, of Maine, has acquired a large interest in the Richmond-Eureka Mining Co. which owns several of the old mines in the camp of Eureka, Nev. The buying company, which is controlled by the E. A. Holter and H. P. Henderson Syndicate, of New York, will spend a large sum in equipping and developing the property. The stockholders of the Richmond-Eureka company include the U. S. Smelting, Refining & Mining Co., Henry C. Frick, J. H. MacKenzie, and others.

Utah Mines Pay Seven Taxes

Seven different kinds of taxes are among the burdens with which Utah mines are struggling during the period of reconstruction. This means not only a large pecuniary outlay on the part of mining companies endeavoring to adjust themselves to present labor conditions, slowness of delivery of materials, and high costs, but also a large amount of clerical labor, which is an additional expense.

The heaviest taxes are the Federal income and excess-profits taxes. The remaining five forms of taxation, including the cost of workmen's compensation as a tax, are briefly: The state property tax, based on the valuation of ground purchased from the Government and the tax on equipment; the tax on the net proceeds of mines, which is based on three times the net proceeds of mines, the rate of taxation being that of the county in which the mine in question is situated; the Federal capital stock tax, on which the rate has been increased to $1 per $1,000, this year on everything over $5,000, the basis of valuation of stock being the market value, capitalization, or capitalization of earnings; the Federal tax of 10 per cent on the corporation's undistributed earnings, carried from year to year; and, lastly, the cost of workmen's compensation.

Mayflower Lode Proved to Have Been Cut Two Months Ago

Unusual interest is taken in the fact that development operations in the Mayflower-Old Colony shaft, near Calumet, Mich., show, beyond a doubt, that the shaft cut through the lode at 1,403 ft. Diamond-drill exploration, upon which the shaft work was based, showed the lode at two points, 1,400 ft. and 1,700 ft. There was a peculiar geological condition in the shaft. Physical developments at 1,550 ft. verify the assumption that the lode was cut in the shaft proper sixty days ago.

Although this work has not resulted in opening the lode to an extent which will assure its commercial operation on a successful basis, the mere fact that this formation has possibilities is increasingly important in its bearing on the future of the district, particularly because the Mayflower is outside the accepted limits of the mineralized area.

Mason Valley Smeltery May be Re-opened on Custom Basis

Freight Rates on Ore Must First Be Lowered on Western Pacific Railway

One of the important matters brought to the attention of the Nevada Public Service Commission is the application of the management of the Mason Valley Mines Co. for satisfactory railroad rates covering the movement of ores from Plumas County, Cal., north of Reno, over the Western Pacific Ry., to the smeltery at Wabuska.

Contingent upon the securing of such rates the company has declared its intention of reopening the smeltery for operations on a custom basis, something that it has not done heretofore, its operations having been confined to smelting its own ores from the Mason Valley mines. This change would necessitate the installation of reverberatories. It is claimed that the success of the project would mean much to the State, as it would make possible the mining of low-grade ore deposits situated at or near points along direct railroad lines, but that will not bear the cost of transportation to either Salt Lake or California smelteries.

The rates in question, in this particular application, are interstate, and are not within the jurisdiction of the Nevada Public Service Commission. However, the commission may act as attorney in fact, and Commissioner Shaughnessy has been authorized and directed to take the matter up with the regional committee of the U. S. Railroad Administration at San Francisco.

Yukon Navigation Closed October 8

Navigation on the Yukon River was closed on Oct. 8. The movement of Yukoners to the coast for the winter was not as great as usual, owing chiefly to reports of unrest on the outside and to the fact that silver-mining prospects are very bright in Mayo, Twelve Mile, and Fairbanks camps, where many will be engaged. The usual winter gold mining also requires many men.

PROGRESS OF MINING OPERATIONS

Important Events of Interest
Condensed and Classified
for Easy Reference

ALASKA

Kennecott Copper Co.'s production, including that of the Braden Copper Co., was 9,928,000 lb. in September, compared with 8,224,000 lb. in August and 5,508,000 lb. in September, 1918.

ARIZONA

GLOBE-MIAMI DISTRICT

Inspiration—The Inspiration Consolidated Copper Co. is operating fourteen of the twenty sections of its concentrator and milling about 13,500 tons of ore per day, which is about two-thirds capacity. The company is preparing to resume churn-drilling operations to check up data already obtained and to complete its records. Drilling will start in the vicinity of the Bull Dog fault. The data obtained will enable the engineering staff to complete its work of preparing sections of the orebodies.—At Miami, the new 50-ton concentrator of the Miami Mining & Milling Co. will be ready for operation Nov. 1. Equipment for a second 50-ton unit has been ordered. The shaft of the Van Dyke Copper Co. has reached the 450-ft. point.

Globe—Excavations for the foundations of the Iron Cap Copper Co.'s new concentrator are nearly complete and the concrete work will be started soon. Extension of the power line to the new mill is under way. A new sump and pump station have been cut on the 130 level, where a large Aldrich quintuplex, electrically driven pump will be installed, which will deliver 18,000 gal. of water per hour for use in the mill.—Operations at the Superior & Boston are confined to development work, except for two leases. Diamond drilling to pick up the eastern extension of the Old Dominion vein is being done from the 12th level.—At Bellevue, the Arizona Globe's shaft entered the hanging wall of the vein at 480 ft. disclosing high-grade milling ore. The Gibson Consolidated's new mill is operating three shifts on dump ores and turning out three cars of concentrates per week. The company is planning to treat a limited tonnage from the Arizona Globe. The "A" shaft of the Old Dominion company is down to about the 20th level, sinking being impeded by a flow of 2,000,000 gal. per day.

PIMA AND MARICOPA COUNTIES

Silver Bell—Percy Williams and associates leasing the old El Tiro mine near the Silver Bell have opened up 35 ft. of 8 per cent copper ore at the 100 level. Eight cars a week are being shipped to the Hayden smeltery.

Tucson — Suit has been entered against the operating company of the Reiniger-Freeman property by William L. Wakefield, alleging forfeiture by reason of non-payment of instalment on purchase due Oct. 9. Damages of $5,000 are claimed for alleged removal of machinery.—The Silverita property is shipping ore valued at $250 a ton in copper and silver. This property was formerly known as the Yellow Bird.

CHLORIDE, KINGMAN, AND HACKBERRY

Chloride—The Chloride tunnel project is reported by J. C. Rankin, manager, to have been financed through T. B. Scott, of New York, for $100,000 subscribed by companies controlling the Samoa, Lucky Boy-Brighter Days, and Rainbow properties, to be benefited by the tunnel.—Sinking on the Diana property has cut the ledge on the dip at 370 ft., the ore running well in silver and gold. Water is giving trouble.

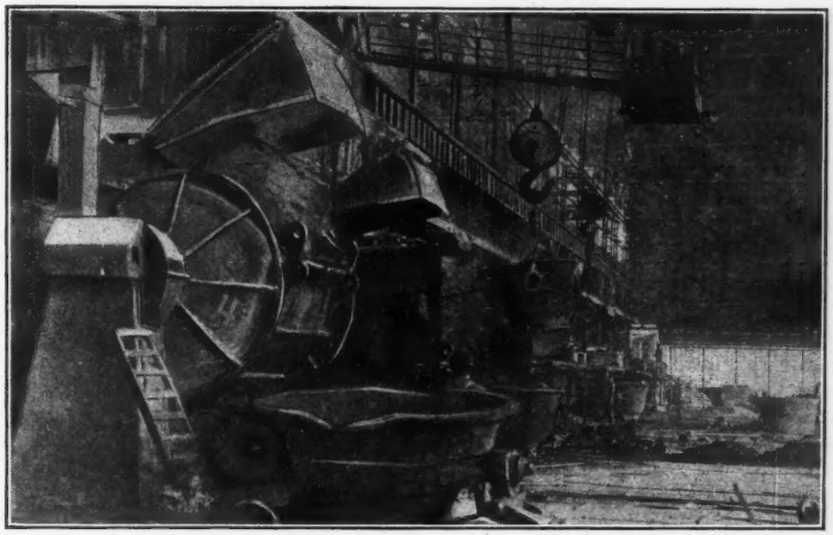
Kingman — The new electrically driven hoist and compressor plant of the Rural-Buckeye property at Mineral Park is now in operation. The Buckeye tunnel is to be driven further. This property was taken over by M. B. Dudley and associates.—The Catherine gold mine west of Union Pass has developed 12 ft. of good ore in a 30-ft. vein on the 200 level.

Hackberry—The Hackberry Consolidated Mining Co.'s new mill is operating and making good recovery. A new shaft is planned to permit exploration without interfering with hoisting.—The Senate Silver company now has a station completed at the bottom.

PRESCOTT AND CROWN KING

Copper Basin—This district west of Prescott is showing much activity with development work being done on the J. & J., L. L. Le Varr, and Martin Shuber groups. The J. & J. has a strike of rich silver ore at 270 ft.

Crown King—The Montezuma property has been taken over by a Colorado company.—The Philadelphia Mining Co., operating the Nelson property, has cut ore 3,000 ft. from the tunnel portal and 700 ft. below collar. A raise will be started as well as a crosscut toward several parallel veins.



CONVERTER BUILDING, MAMMOTH COPPER MINING CO, KENNETT, CAL.

CALIFORNIA

MINING ON THE MOTHER LODE

Plymouth—The Plymouth Consolidated Gold Mines encountered very heavy ground in deepening its shaft from the 2,600 to 2,700 level. Other means of support than wooden sets was necessary. Sixty feet of the worst ground is now carried by steel girders in the form of ordinary shaft sets. Girders rest on concrete pillars placed on each side of the shaft. The experimental work will be finished soon and if found successful other parts of the shaft will be treated likewise. The shaft will be flattened to 45 deg. to pass through the broken ground as soon as possible. When the hanging wall is reached the shaft will be straightened and sinking

continued. The nature of the foot-wall country makes it impossible to turn the shaft to follow the foot wall, where it should be, for the economical working of the vein.

Jackson—The 3,700 level south drift of the Central Eureka Mining Co. at 240 ft. south of crosscut has the vein 18 in. wide but low grade. The north drift 92 ft. from the station has 3 ft. of milling ore. The two-compartment, north foot wall raise, from the 3,700 level is up 41 ft. This will connect with the winze from the 3,500 level. The 3,350 south drift is cleaned out and the track laid to grade. Ten stamps have been hung up to permit replacing rotten mortar blocks with concrete. Thirty stamps will be used.

Angels—The Morgan mine's production for September was over the August record of $105,000. The force will be doubled to increase production. Diamond drilling is under way in the search for the downward extension of four known oreshoots.—The Lee mine has purchased the Utica chlorination plant and will use the lumber for building purposes.

Alleghany — William Simpkins will make arrangements for immediate resumption of work under option to Fred Searles, Jr.

Grass Valley—The Central Consolidated Mines Co. has acquired the Central, Banner, and North Banner properties. A development campaign is being planned as well as the erection of a mill.

THE COPPER DISTRICTS

Kennett—The Mammoth Copper Co. has increased its force to sixty men, and placed four drills in operation. Development of new territory is claiming principal attention. Shipments of silicous ores from the Reid mine and other properties are being received at the smeltery and stored in yards for future use. The smeltery has been idle since the strike of last spring.

Engelmine—The Feather River Copper Co. has taken over the Snowstorm group adjoining the property of Engels Copper Co. Orders have been placed for mining machinery and compressors.

BISMUTH IN INYO COUNTY

Keeler—Bismuth has recently been found in the Silver Reef property, occurring as tetradymite. Leases have been granted.

COLORADO

EMPIRE—TELLURIDE

Empire—The Primos Chemical Co. has about seventy men on the payroll at its plant at Urad, near Empire, Col., employed on development in both upper and lower tunnels, on mill repairs, and on tramway construction. The 60-ton plant, which has been idle since June, is said to have two Marcy mills, flotation equipment, and concentrating tables. The new tramway is 1,200 ft. long, with steel towers and concrete footings. The vein worked is said to be 43 ft. wide and porphyritic and runs about 2 per cent molybdenum sulphide. Commercial lead-silver ore was recently cut. Appearances indicate company is planning steady operation.

Telluride — Concentrate shipments from the station in September were: Tomboy 55 cars; Smuggler-Union 41; B. Perino 2; and John M. Wagner shipped 3 from Cimarron. Shipments were larger than last year's.

MICHIGAN

GOGEBIC RANGE

Bessemer—The Tilden company plans to sink another shaft about 500 ft. deep west and north of No. 10 shaft near 11th level ore. No. 10's hoist is working to capacity. Extent of the 11th level orebody has not been determined.

MARQUETTE RANGE

Ishpeming—It is impossible to work the plans of the Cleveland Cliffs Iron Co. to capacity, owing to lack of rain, which has lowered the streams supplying the power plants. A new and larger storage basin is to be created on the Dead River, north of Ishpeming.

MENOMINEE RANGE

Vulcan—The Penn Iron Mining Co. is working all mines on a basis of four days a week, because of large stocks of ore on hand. This is the first Michigan company to reduce to this basis. Some have closed and others have reduced forces.

NEVADA

VIRGINIA CITY—McGILL—DIVIDE

Comstock Lode—Active development has been resumed on all properties in the district. A feature of the week was Consolidated Virginia's production of 457 tons of ore, valued at $12,000, from the new vein on the 2,150 level.

McGill—The September production of the Nevada Consolidated Copper Co. was 4,250 lb. copper, against 6,670,415 lb. a year ago. There was no production in August, owing to the strike.

Divide—The Post Office Department has given the townsite in the Divide district the name of "Sigold," instead of Divide City, as the promoters wished.

NEW MEXICO

Santa Rita—The September production of the Chino Copper Co. was 3,538,704 lb., against 3,321,857 in August and 7,936,000 a year ago.

UTAH

TINTIC DISTRICT—BINGHAM CANYON—PARK CITY

Eureka—Tintic shipments for the week ended Oct. 18 were 114 cars. The May Day company has let a contract for 500 ft. of drifting to the west on the 1,800 level, starting from the Yankee side line. The Pinion Queen is said to have let a contract for sinking a shaft the first 500 ft. to Jack Aho.—The Tintic Standard will deepen the south shaft, now down 1,050 ft., by 500 ft.

Bingham Canyon—The Utah Apex company recently resumed shipments, and expects to reach 500 tons daily. Preparations are being made under Waldemar Lindgren for the suit with Utah Consolidated to begin Nov. 6.

Park City—The Silver King Coalition Co. was granted a writ of certiorari in its suit with the Conkling company, claiming damages for ore illegally extracted from adjoining claims.

WISCONSIN

ZINC-LEAD DISTRICT

Platteville—The Wisconsin Zinc Co. has just started a 170-ft. shaft on the Booty land one-half mile west of the Winskell. The C. A. T. No. 2 mine has been connected by a 700-ft. drift with the old workings of C. A. T. No. 1, on the C. A. Thompson land at New Diggings.—The Vinegar Hill Zinc Co. has proved up an extension of the Hoskins Range for 550 ft. by drilling on the William Fields land; a shaft will be sunk and the Meloy mill equipment utilized. A new run has been proved up on the Heughlett and Gray land at Days Siding where a new shaft is being sunk. The new shaft on the James Copeland land at Shullsburg is completed. The Dale Rundell mill has just been placed in operation at Livingston.

Linden—The new Fearless company began milling on the Rule land with equipment newly assembled on the Optimo No. 4 tract at Linden.—McKay Brothers are operating the mine and mill recently purchased from Ross Bros., of Mineral Point.

Cuba City—The old Beacon Hill property one mile south of Cuba City is being developed by Newton Varker and others. The Anthony mine is being reopened by Baldwin and Uren.

MEXICO

The American Smelting & Refining Co. started up its Velardena smeltery at Asarco, Dgo., with one furnace on Oct. 23. For several months the company has been working on the construction of the Veta Grande 600-ton cyanide plant near Parral as steadily as conditions would permit. This plant may be ready for operation by Mar. 1, 1920.

The El Oro Mining & Railway Co. recently declared a dividend of 5 per cent, or 1s. per share, which was payable on Oct. 31, absorbing £57,375.

CHILE

Chile Copper Co. produced 7,044,000 lb. copper in September, compared with 8,994,210 in August, and 7,346,000 in September, 1918.

THE MARKET REPORT

Daily and Weekly Metal and Mineral Prices, Metal Market Conditions, Average Monthly Prices, Stock Quotations

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver		Oct.	Sterling Exchange	Silver	
		New York, Cents	London, Pence			New York, Cents	London, Pence
23	416	118⅜	63⅞	27	417	120¾	65
24	415½	118⅞	64¼	28	417	121½	65⅜
25	415¾	119½	64½	29	415⅝	123¼	66½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Daily Prices of Metals in New York

Oct.	Copper	Tin	Lead		Zinc
	Electrolytic	Spot	N. Y.	St. L.	St. L.
23	21½@21¾	54⅜@54⅞	6¾	6½	7.75@7.80
24	21⅜@21⅝	54⅜@54⅞	6¾	6½	7.75@7.80
25	21¼@21½	54⅜@54⅞	6¾	6½	7.75@7.85
27	21¼@21½	54⅜@54⅞	6.75@6.80	6½	7.60@7.70
28	21¼@21⅜	54⅜@54⅞	6.75@6.80	6½	7.55@7.60
29	21¼@21⅜	54⅜@54⅞	6.75@6.85	6½	7½

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of American tin, 99 per cent grade.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M.		Spot	3 M.	Spot	3 M.	Spot	3 M.
23	102¼	102¼	115	280	281	30½	31¼	45½	45¾
24	100½	100¾	114	279	280	30⅜	30⅞	45½	45¾
25	....	....	....	....	....	....	....	....	....
27	98¼	99	114	273½	274½	29⅞	30⅜	45	45½
28	99⅛	99¾	114	275¾	277	30⅜	30¾	45	45¼
29	100	100¾	114	276¾	277¾	30½	30⅝	44½	44⅞

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, Oct. 29, 1919

The quotation for zinc blende of Prime Western grade in the Joplin market for the week ending Aug. 30, 1919, should have been $45 basis, instead of $47.50. Our attention was called to the error soon afterward, and some settlements were held in abeyance on account thereof. It was necessary for us to make an investigation of the situation; wherefore the delay in making the correction, which is now formally made.

Copper was very dull and was weakish. In lead a further sharp advance was recorded. In zinc there was a sharp recession, with rather active business.

Transatlantic freights were unchanged. The rates from San Francisco to Hongkong and Kobe continued at $20.

Copper

Scarcely any business was done by the principal producers. The report that one of them had cut prices and secured a large order was entirely unfounded. However, one agency succeeded in disposing of two or three round lots. Among producers and agencies there is active competition, and any one of them is ready to meet the market. The latter eased off a little from day to day, and at the close 21⅜c., f.o.b. refinery, could be done in any quarter, with the probability that 21¼c. would be accepted. Business was actually accepted at 21¼c. by some of the smaller agencies.

United States copper production in August, 1919, amounted to 107,994,040 lb., compared with 100,369,247 lb. in July, 1919, and 165,550,799 lb. in August, 1918. Imports of copper in ore and concentrates, and blister, during August, 1919, amounted to 23,389,574 lbs.

Copper Sheets—32½c. per lb. Wire, 25c. Domestic buying dull.

Tin

The market for spot tin was erratic, owing to conditions resulting from the longshoremen's strike, which continues.

Singapore quoted £287½, c.i.f. London, each day of the week.

Lead

The A. S. & R. Co. advanced its price to 6¾c. early on Oct. 23. Demand continued good, and later in the week independent producers began to realize higher prices. At the same time there were a few transactions in lead at prices below that of the A. S. & R. Co. These represented metal in out-of-the-way places, and to some extent probably were the re-selling of lead purchased from the Government.

The demand for lead products continues very large, especially from the building trade. The requirements for pipe, lead traps, and other plumbing supplies, is extraordinary. Business in white lead also continues good. The demand from the storage battery people is insatiable. An active business in shot is going on, and there is a good deal of foreign demand for that manufacture.

Zinc

Some further large quantities were sold for export, especially to England, these transactions occurring at the beginning of the week, and the market advanced to about 7.80c. on the average. At that level very free selling was encountered, this representing in part the liquidation of a good many small speculative accounts, but there was also considerable selling by the smaller producers. These free offerings resulted in a sharp decline, but the metal that was offered was readily taken by strong hands, and there is no reason to suppose that the reaction of this week was anything but a temporary setback. Economic conditions making for a strong market continue unchanged. It is certain that Europe is going to require a good deal more of our zinc than it has yet bought in this movement.

Business in high-grade zinc was done this week at 8½c., delivered, but it is understood that there is still a tonnage in New York that can be bought at 8c.

The following zinc smelteries are now idle, owing to strikes: Donora, Terre Haute, Peru. Labor troubles at La Salle were reported this morning.

An active foreign demand for American sheet zinc is developing.

Zinc Sheets—$10.50 per 100 lbs.

Aluminum—33c. per lb.

Antimony—Unchanged at 8¾c. for spot. Futures were quoted at 9@9¼c., duty paid.

Bismuth—Unchanged at $2.96.

Cadmium—$1.40@$1.50.

Nickel—Ingot, 42c.; shot, 43c; electrolytic, 45c.

Quicksilver — Quicksilver to arrive was quoted at $80@$85. San Francisco telegraphs $82.50, steady.

Silver—Owing to limited supplies, London has advanced rapidly during the last few days. With no shipments at present from New York, London is dependent on the white metal from other sources. It is understood that Canada, Australia, and France have been making moderate consignments to that quarter. China is still a buyer, and has been the chief factor in causing the advance.

Mexican dollars at New York: Oct. 23, 93; Oct. 24, 93½; Oct. 25, 94½; Oct. 27, 95¾; Oct. 28, 95⅞; Oct. 29, 97.

Platinum—Shortage in the supply continues, and the market responds quickly to any increase in demand. This week it was a little stronger. We quote refined ingot at $130@$135.

Palladium—Unchanged at $120.

Manganese Ore—Brazilian ore of 45 per cent grade was offered at 50c. per unit, c.i.f. Atlantic ports, without finding buyers.

Tungsten Ore—Some business in Chinese ore was done at $7.

Molybdenum Ore—Quoted nominally at 75c. per lb. of molybdenum sulphide.

Pyrites—Spanish pyrites is quoted at 17½c. per unit for furnace size ore, free from fines, c.i.f. New York or other Atlantic ports. Sulphur companies reported to be selling at prices as low as 14@15c. Market unsettled.

Zinc and Lead Ore Market

Joplin, Mo., Oct. 25.—Zinc blende, per ton, high, $49.50; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@42.50; calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $45.09; calamine, $32.20; all zinc ores, $44.64.

Lead, high, $86.15; basis 80 per cent lead, $85@80; average settling price, all grades of lead, $82.58 per ton.

Shipments the week: Blende, 8,231; calamine, 285; lead, 1,646 tons. Value, all ores the week, $517,230.

Shipments ten months: Blende, 392,229; calamine, 10,865; lead, 59,944 tons. Value, all ores ten months, $20,472,800.

The rumored transfer of the Ontario lead smelting plant to the Eagle-Picher Lead Co. is denied by the retiring President, Mr. Jones, who acknowledges he may go with the Eagle-Picher Lead Co., but asserts the plant will be continued as an independent concern.

Platteville, Wis., Oct. 25.—Blende, 60 per cent zinc, $50@51 was paid for Prime Western grade, due to keen competition among buyers who had to get ore. Lead ore, basis 80 per cent lead, $80 per ton. Shipments for the week are 2,527 tons blende, 115 tons galena, and 328 tons sulphur ore. For the year to date the totals are: 82,283 tons blende, 5,338 tons galena, and 16,457 tons sulphur ore. During the week 2,934 tons blende was shipped to separating plants. (A total of 2,500 tons sulphur ore shipped previously and not before reported is now included in year to date.)

Iron Trade Review

Pittsburgh—Oct. 28

The iron and steel strike, now in its sixth week, is receding somewhat less slowly than in the first three or four weeks. The Lackawanna Steel Co., in the Buffalo district, has made a fair start at resuming. There is a little operation at Cleveland, formerly closed tight. In the Mahoning Valley not less than six blast furnaces are operating, against none during the first three weeks, together with about a dozen open-hearth furnaces and one bessemer converter. The Wheeling district remains tightly closed. At Chicago and Gary operations are better, the district as a whole now running at nearly 50 per cent in point of tonnage. In western Pennsylvania production of pig iron, unfinished steel and finished products is between 85 and 90 per cent of normal. The last report as to the Homestead Steel Works showed production at 83.3 per cent of rated capacity, and the plant was not producing at capacity before the strike. The Sheriff of Allegheny County testified to the Senate committee investigating the strike that not more than 5,000 strikers remain in the county, but up the Monongahela, beyond the county line, Monessen remains almost closed, one plant doing nothing, another operating 10 per cent and the third doing about 15 per cent in its primary operation but not finishing the material. The Shenango and Allegheny Valleys are almost normal.

The United States Steel Corporation is positively opposed to there being any steel price advances at this time, and some of the leading independents are probably of the same mind. As the end of October is already at hand this means that in due course regular customers will be booked for first quarter or first half of 1920 at March 21 prices. The free play of demand and supply would easily force much higher prices, and some of the smaller independents, which do not normally sell far ahead, will probably secure stiff delivery premiums, as it is probable there will not be enough steel to go around.

Pig Iron—An advancing tendency is noted in the local market, following advances in Philadelphia, Chicago, Birmingham and other markets, and some sales at advanced prices are reported, but in the main the market is quotable at Mar. 21 prices: Bessemer, $27.95; basic, $25.75; malleable, $26.25@27.25; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh.

Ferromanganese—English ferromanganese has sold at $100, c.i.f., against $95 quoted at the end of August and for some time afterwards, and it is difficult now to secure a quotation at $100. Domestic producers continue to quote $110, delivered, as their regular figure, but the price has sometimes been shaded slightly. Spiegeleisen remains in no demand for domestic consumption, but some export demand has sprung up lately, and one lot of 16 to 18 per cent has gone at $33, f.o.b. furnace.

Steel—The Steel Corporation is operating 88 per cent of its sheet mills, while 52 per cent of the independent sheet mills are operating, and tin mill operations are about 55 per cent. This means much more consumption than production of sheet bars and stocks are beginning to play out. Occasionally a lot of sheet bars can be picked up, at $2@3 premium. We quote Mar. 21 prices: Billets, $38.50; sheet bars and small billets, $42; slabs, $41; rods, $52. Rods for export have brought $60.

Coke—The threatened strike of union coal miners has stiffened Connellsville operators' views, as there would be a heavy demand for Connellsville coal, and the strike might even extend into the Connellsville region, though it is nonunion. Furnaces are unwilling to stock up except at bargain prices and would pay above $4.75 only in exceptional cases, while there is hardly any coke available at that price. Foundry coke is very strong, regular quality commanding $6@7 depending on brand and whether open top or box car loading.